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July 26, 1941

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Electrical World—Published weekly. Price 25 cents a copy. Allow at least ten days for change of address. All communications about subscriptions should be addressed to the Director of Circulation, 330 West 42d Street, New York, N. Y. Subscription rates: In the United States, Mexico, Central and South American countries, $5 a year, $8 for two years, $10 for three years; Canada, $5.50 for one year, $9 for two years, $11 for three years (Canadian money at par). Great Britain and British possessions, 54 shillings for one year, 108 shillings for three years. All other countries $9 for one year, $18 for three years. Entered as second-class matter November 16, 1936, at Post Office at Albany, N. Y., under the Act of March 3, 1879. Printed in U. S. A. Contents copyrighted, 1941, by McGraw-Hill Publishing Company, Inc. Branch Offices: 520 North Michigan Avenue, Chicago; 68 Post Street, San Francisco; Aldwych House, Aldwych, London, W. C. 2; Washington, Philadelphia, Cleveland, Detroit, St. Louis, Boston, Atlanta, Ga.

Publication Office
99-129 North Broadway, Albany, N. Y.

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330 West 42d Street, New York, N. Y.

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ELECTRICAL WORLD • JULY 26, 1941

It All Depends on Me

A letter recently received in this country from an Englishman engaged in the electrical industry commented on a slogan that is gaining in usage over there—"It all depends on me." What a wonderful thing it would be if that feeling pervaded the emotions and the actions of the business and of all the people of this country. The time now lost in wasteful dissension between labor and capital, between government and business, between the different agencies and individuals of government—all would be turned into coordinated pursuits with but one end in mind — How to beat Hitler and preserve the American way of life.

Business will ask why it should go all out when cabinet members and bureau executives are using defense as a measure to destroy private industry. Obviously, the socialistic attitude of certain Washington leaders and their satellites is hurting the cause of defense, but industry can overcome some of it by acting on the theory that "It all depends on me."

There are men in Washington who are giving their government almost every waking hour of their day. They subscribe to "It all depends on me." Those others who would defile the most sacred thing in the world if it would but promote their personal ambitions to nationalize business, and especially utilities, have no conscience that would accept this slogan.

When we turn to the electrical industry with this slogan "It all depends on me," not only the individuals, but business as well, we find that the workers understand what this means. If ever labor leaders would give them a chance to settle down for a spell the workers would show in volume of output their interpretation.

Business, on the other hand, is always more selfish. Ordinarily it has to be selfish for two reasons: to provide continuity to employment, and because management is but the trustee for the owners. However, at this time the thinking of management must go beyond the confines of money. Expenditures for lines and plant may at the moment seem unwarranted and present a spectre of post-war idleness. Even so, if there is a possibility that the spending of the money in that way will further the defense preparations, let there be no hesitation.

If certain metals or supplies are badly needed for munitions, it doesn't do any good trying to salve one's conscience because one has hoarded by saying, "Well, everybody else is doing it." It doesn't make any difference what the other fellow does; "It all depends on me."

Let it not be thought that we mean to imply that the electrical industry has been backward in giving its support to the defense program. To the contrary, the record of new capacity and lines erected in the past two years and on order is ample testimony of the cooperation of an industry that has received nothing but kicks and abuse from its government for the past eight years.

We merely suggest that defense would be helped that much more if each company were to justify its policies and activities on the basis of "It all depends on me."

Estimate Secondary Loads From Customer Kilowatt-Hours

Monthly consumption related to customer maximum demand and to diversity of an appliance group — Basis for system of designing secondary distribution with much closer load estimation and more economical use of transformer capacity

M. F. HATCH,* Washington Water Power Company, Spokane, Wash.

ACCURATE determination of customer demands is the very foundation of secondary distribution circuit design. This information is essential if economical transformer loading and spacing are to result and satisfactory service voltage is to be maintained. Common approach has been to assign an average maximum demand to each type of appliance, whose group demand is then determined from diversity curves. Average maximum demand of an appliance and its diversity, when used in quantities, is fairly well agreed upon.

However, the root of the problem is to obtain correct information as to the appliances actually being used by each customer. Customer records are used quite widely, but the hopelessness of up-to-the-minute accuracy is quite apparent. It is only natural for the distribution engineer, in the face of inadequate information, to be on the safe side, with the result that surplus transformer and secondary capacity is quite generally to be found.

Believing that approach through information on monthly kilowatt-hour consumption was the only logical one, and also realizing that the customer's actual consumption was as easily obtainable as simply his designation into different classifications, since his meter sheet had to be looked up in either case, a series of curves was developed showing increasing demand corresponding to increasing consumption. The logic behind this seems quite reasonable:

A customer, in using more kilowatt-hours, must either have more appliances, in actual number or wattage, or he must use them a longer number of hours. In either case, his demand, when considered in diversity with those of other customers, should be higher than if he used fewer kilowatt-hours. In other words, he either has more actual watts in use at the time of the group peak, or he has more chance of hitting the peak through lessened diversity. This discussion, of course, eliminates definite off-peak loads, the water heater being the only one in general residential use. Since there are so many different kinds and sizes of water heaters, subject to various methods of off-peak control, this load has not been considered in this presentation. Each company most likely keeps complete records of its water-heater load, and its diversified demand can

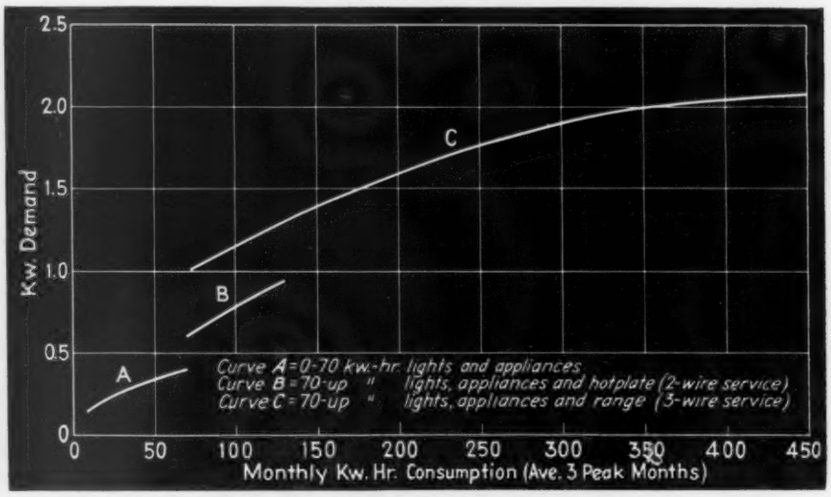


Fig. 1—Diversified half-hour maximum demand per customer (in groups of 10)

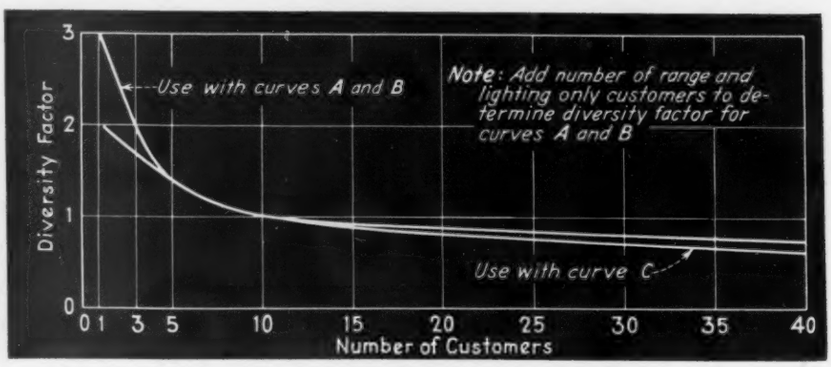


Fig. 2—Diversity factors of groups of customers to be applied to demand values in Fig. 1

*Distribution engineer.

be added separately, after due allowance has been given to the method of operation in use by the particular company.

Diversified Demand

From the curves shown in Fig. 1 the diversified demand of a customer is determined from his monthly kilowatt-hour consumption. These curves are based upon a coincident lighting and range peak occurring in the winter months, and a rough average of the customer's highest three-month usage is used. Each curve is evolved around a value generally agreed upon as the probable average demand; in curve A an average customer with lighting and small appliances only uses 50 kw.-hr. in his peak month and creates a diversified demand each in a group of ten customers of 0.35 kw.; in curve C the average customer, with a range in addition to lights and small appliances, uses 150 kw.-hr. in his peak month, causing a diversified demand each in a group of ten customers of 1.4 kw. Curve B is included for the customer with a two-wire service only, yet using over 70 kw.-hr. and in all probability having a roaster or hot plate in use. Empirical curves were then drawn through these average points embracing monthly consumption from 0 to 500 kw.-hr., and the curves were then subjected to continual modification by comparisons against hundreds of actual distribution load tests by Maximeters and ammeter charts during the past three winters.

A demand value is thereby obtained which can be attached to each residential service supplied from a secondary district and it is now necessary only to apply a diversity factor, from Fig. 2, in accordance with the number of customers involved. The diversity curves were purposely drawn with a factor of 1 for a group of ten customers, so that the average case would have a factor near unity and approximations of secondary load conditions could be made at a quick glance when necessary, without resorting to detailed calculations. These diversity factors are in good agreement with those published and generally used by many other companies. The number of ranges only is used in obtaining the range customer diversity factor applied to curve C, while the sum of range and lighting customers only is used in arriving at the lighting customer diversity factor applied to curves A and B.

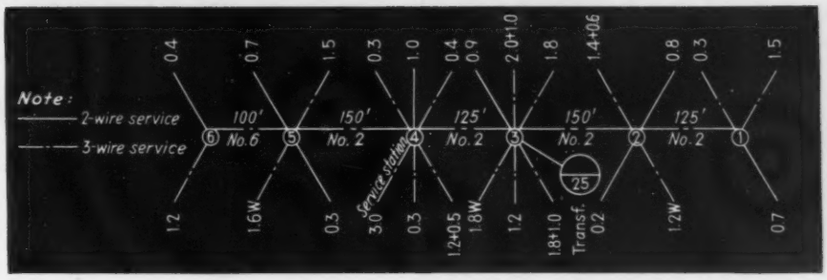


Fig. 3—Secondary distribution designed on diversified demands at each pole

The first figure shown for each service is the demand obtained from Fig. 1 corresponding to the customer's kilowatt-hour use. The second figure added represents a water heater installation, with the letter "W" signifying full off-peak control and the figure representing the wattage of the lower element of an uncontrolled heater, which demand would coincide with the range peak in diversity with the total group of heaters.

Span	No. Cust.	Sum Kw.	Div. F		Div. Kw.	Dist.	Kw.–1,000 Ft.	K	% Volt Drop
6—5	1L	0.4 x 2.5	=	1.0	3.4 x 100	=	0.34/	0.62	= 0.55
	1R	1.2 x 2.0	=	2.4					
5—4	3L	1.4 x 1.3	=	1.8	8.9 x 150	=	1.33/	1.37	= 0.98
	3R	4.3 x 1.65	=	7.1					
	7L	3.4 x 0.97	=	3.3					
4—3	4R	5.5 x 1.5	=	8.2	15.0 x 125	=	1.87/	1.37	= 1.37
	1W	0.5 x 1.0	=	0.5					
	1S	3.0 x 1.0	=	3.0			Max. volt drop to cust.		2.90
Trans. Peak	12L	6.3 x 0.82	=	5.1					
	12R	18.2 x 0.92	=	16.7					
	4W	3.1 x 0.95	=	2.9					
	1S	3.0 x 1.0	=	3.0					
				27.7 Kw.					

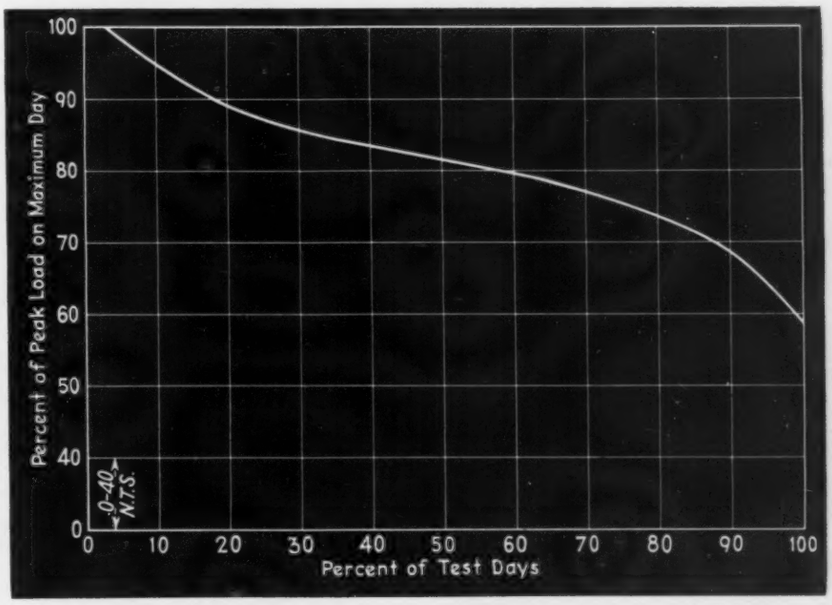


Fig. 4—Probability of attaining peak load of maximum day. Week-days only included

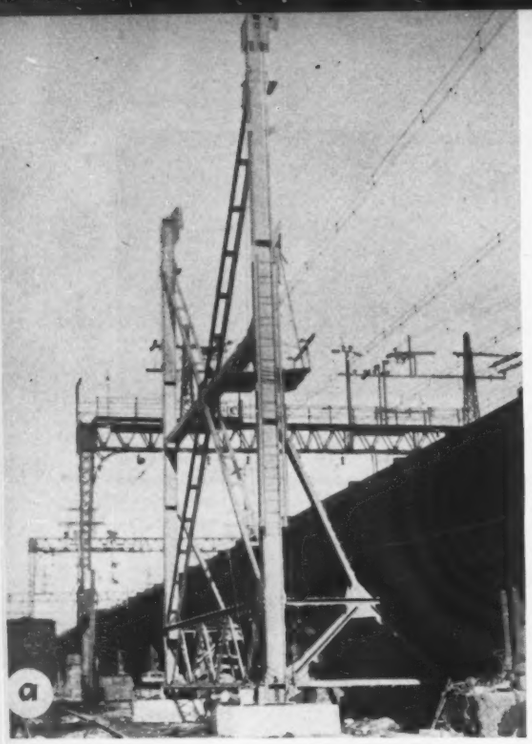
Probably the most accurate method of estimating the demands of occasional commercial establishments is to approximate the average hours of use, or load factor associated with that particular kind of business. The load characteristics of that type of business will determine what proportion of his total demand is likely to be coincident with the evening residential peak load in the district. As mentioned previously, the effect of the water-heating load can be considered separately, its effect and diversity depending entirely on the size of elements and method of control.

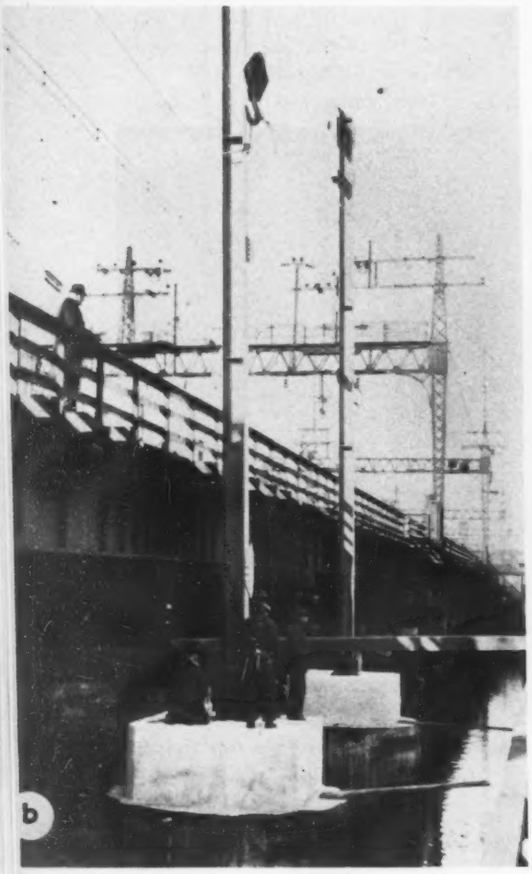
The distribution engineer is now in a position to design a secondary distribution system with some accuracy. He knows the demand of each service, the demand per pole and the total demand on each transformer. With this information, it is then a comparatively simple process to calculate voltage drops, with the result that the correct wire size can be chosen and transformers economically spaced.

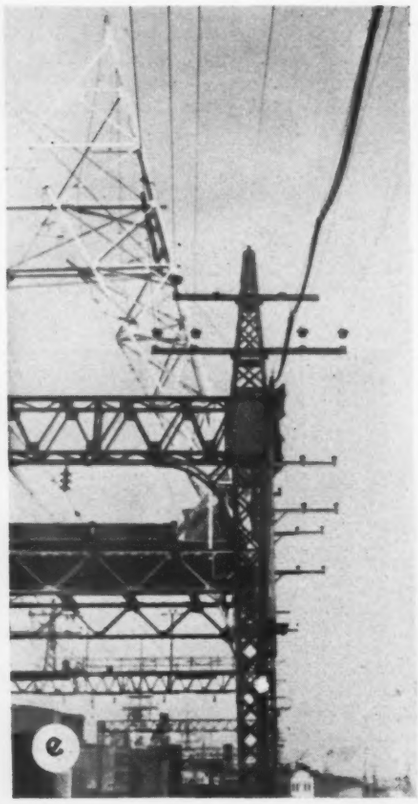
[*Continued on page 47*]

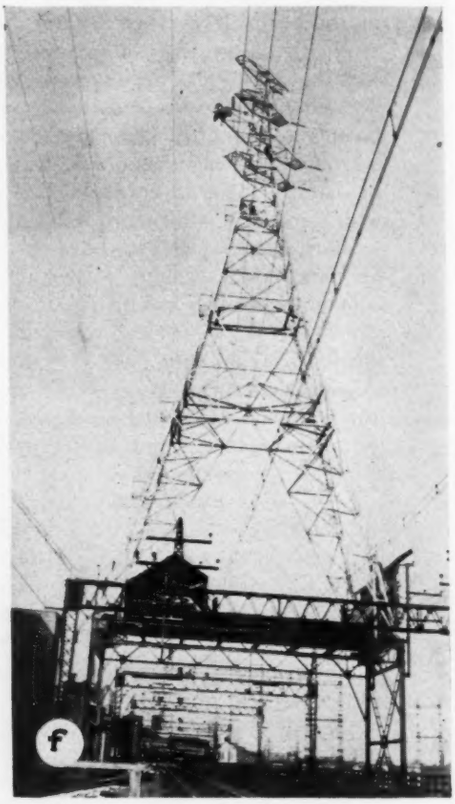
Railway Catenary

SAMUEL A. SPALDING, Gibbs & Hill, Inc., New York*









BRIDGEPORT harbor-crossing tower spans the railroad tracks and catenary structure

(a) Land-side footings on 25-ft. piles. Tower leg bracing provided underneath track girders.

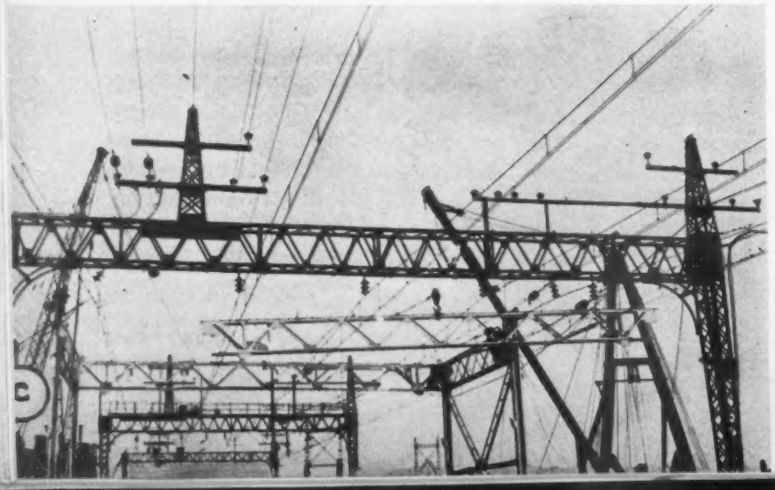
(b) Harbor-side footings on bedrock caisson foundations.

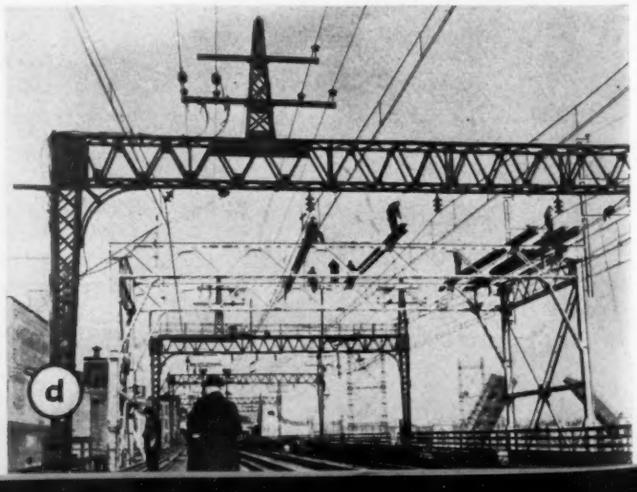
(c) West truss (for floor girder supports) being raised into position over catenary work. This was done between 5 and 6 a.m. with railway circuits de-energized.

(d) Twelve-inch I-beams being laid for temporary decking of 3-in. planks.

(e) Tower erection proceeded from 3-in. temporary plank decking without further interference with railroad operations.

(f) The finished tower is 230 ft. high and independently based, spans the railroad's five tracks for right-angle crossing over Bridgeport Harbor to Steel Point plant. The temporary platform and construction shed had not been removed.





Bridges Carry Utility 66-Kv. Tie—II

Unique structures and safety procedures applied — Construction and despatching supervised by railroad representative — Materials delivered by work train

NUMEROUS items of departure from typical transmission line erection were involved in installing the two 66-kv. tie lines of the United Illuminating Company on the catenary support structures of the New York, New Haven & Hartford Railroad between West Haven and Bridgeport. Electrical design and contractual relations were discussed in ELECTRICAL WORLD, April 19, 1941. Principal points of difference may be enumerated as follows:

Safety of employees.
Maintenance of railroad operation.
Delivery of material.
Erection of material.
Special structures.
Supervision by the railroad.

Protection of employees against accident on the structures and from being injured by passing trains was given first consideration. Experienced steel workers and linemen were employed, weekly safety meetings held and a frequent checkup made of their movements and cautionary talks given them when any indication of carelessness was noticed. Properly qualified railroad employees were present when there was work to be done in which there was any chance of contact with live wires being made by men or the materials they were handling. In order to prevent injury to employees from falling bolts and small hardware, safety helmets were provided for the men subject to such hazard and all small construction materials were raised from the ground in reinforced canvas buckets.

Arrangements were made with the railroad to secure the use of work trains and tracks for the distribution of structural steel extensions, crossarms and poles. It was not found necessary to do any of the construction work with men operating from the track area and there was no interference with train schedules.

The structural material was delivered on cars at Bridgeport with the pieces arranged so that they could be unloaded in proper order. Material was delivered for the most part along the right-of-way from work trains and so located as to be convenient for erection and safe from any contact with the railroad equipment. In addition, small structural steel was secured to the heavier members to safeguard their being disturbed and thrown on the tracks. No work was done in connection with the installation of crossarms, pole extensions or conductors without all the railroad feeder wires on the side on which work was going on being de-energized and grounded.

Bonnets Replaced

For the greater part of the route the structural work consisted in removing the cap on the existing pole bonnet and dropping in and fastening in place the H-column pole extension carrying the crossarms and support for the ground wire. The extensions were hoisted by hand from the ground by the use of a tubular gin pole.

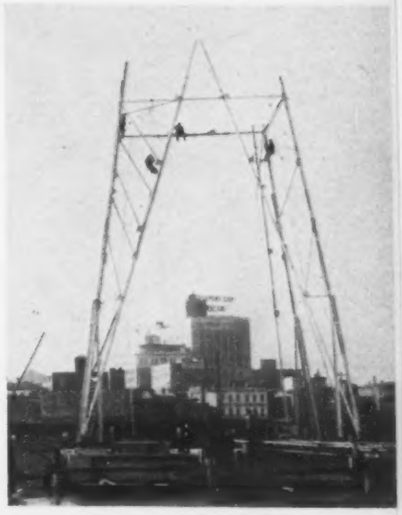
Where new poles were installed independently of the railroad structures they were raised by a 10-ton truck type derrick with a 90-ft. boom, located adjacent to the right-of-way. The feeder wires were temporarily spread, the hook dropped down in the space between the wires and the pole raised and dropped in the foundation, plumbed and wedged in place by special steel wedging jacks. The actual time required for setting the pole in foundation was only 20 minutes. The concreting of the pole was done the same day as erection.

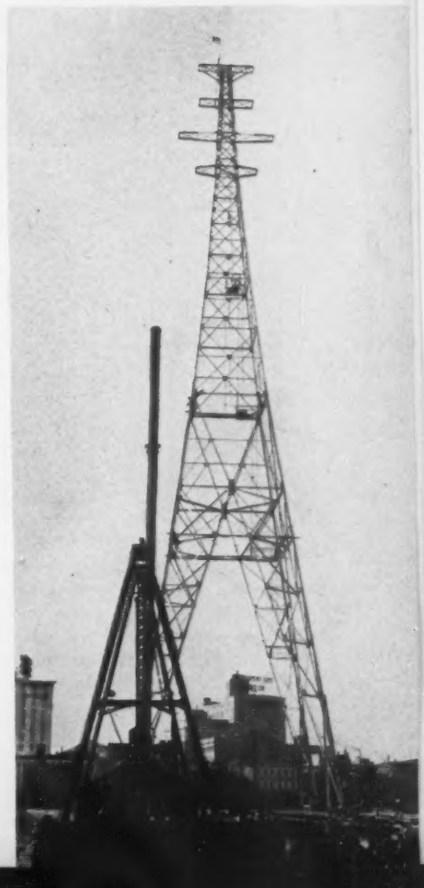
Bridgeport Tower

An unusual piece of construction in connection with this tie line was the erection of the 230-ft. transmission tower spanning the railroad tracks just west of the Bridgeport station. Two of the four legs of the tower are supported on caisson foundations in 20 ft. of water and extending down to bedrock. Thirty-five-foot interlocking sheet piles were driven in circular formation 12 ft. in diameter. The excavation was done with a clamshell bucket. The surface of the rock was examined by a diver and after clearing

[*Continued on page 145*]

South tower (also 230 ft. high) adjacent to substation terminus of the lines at Steel Point station supports harbor-crossing span



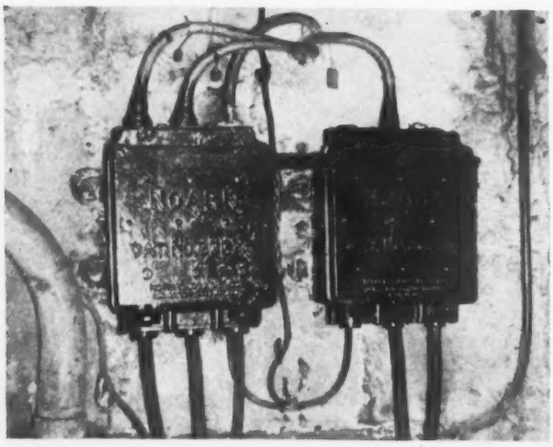


*Chief engineer.

Three-Phase Network for Denser Loads—II

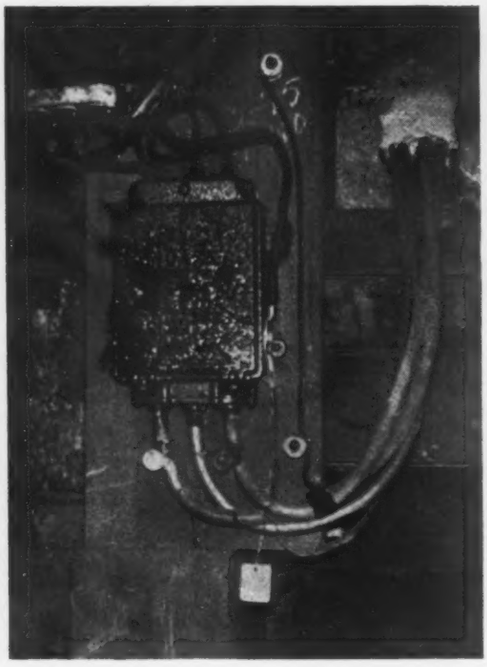
Hartford's downtown distribution system undergoes change to meet increasing demands — Procedure details

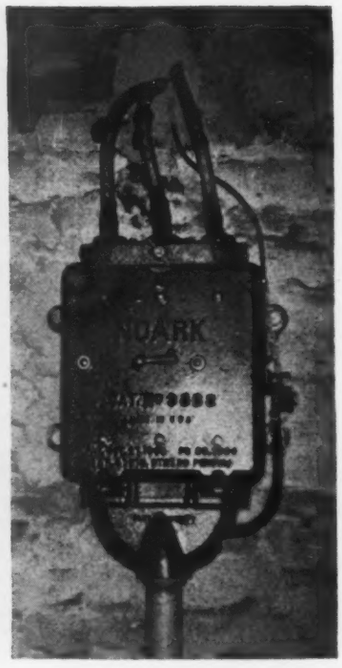
J. H. AHRENS and R. C. FOSBERG, Distribution Department, Hartford Electric Light Company



TWO 400-amp., three-pole Noark boxes in use on a two-phase, five-wire service

Covers are strapped together for simultaneous opening. These boxes were adapted for use on three-phase by removing extra cable from one box as shown. Extra cable at bottom of right-hand box has not been removed. Service cables enter from the street at the top in all cases.





SERVICE entrance box

Left—Noark, 100 amp., three-pole, used on former two-phase system for a three-wire, 115/230-volt single-phase service.

Right—Box reconnected and balanced for a new three-phase service, as connected load was too large to leave single-phase. Same box used for three-phase, four-wire service, bolting the neutral conductor to the side of the box and running the phase legs through the fuses in the box. Savings were made in the cost of changeover by this method.

BASIC FEATURES of Hartford Electric Light Company's new downtown secondary network were outlined by the authors in ELECTRICAL WORLD, June 28, page 46, the installation being of special interest on account of its progressive replacement of a two-phase system of long standing according to a carefully planned development. In this concluding installment the more important problems encountered in making the actual changeover are reviewed and the methods of handling them effectively indicated.

All Services Surveyed

All metering, wiring equipment and apparatus of customers were surveyed in connection with the changeover, service cable size and metering specifications being drawn up and all possible alterations made before cutover. All three-wire, 120/208-volt meters and two-wire, 120-volt meters were installed ahead of cutover. Polyphase meters followed cutover. Heating elements for consumers' equipment were ordered and at hand, ready for the change. Wiring specifications approved by the Hartford Building Department and our engineers were made up for each particular service and reputable electrical contractors were awarded contracts based on five or six services, after bidding. All possible interior wiring alterations preceded cutover.

Prices were obtained for rewinding all types of a.c. motors based on horsepower and speed. For the 1940 program one motor rewinding contractor was selected to handle the work. Prices were also received for alterations to electric elevator equipment, contracts being awarded to

reputable elevator contractors covering one make of elevator to take advantage of standard replacement parts and unified material. Dates and times of cutover were selected to cause minimum inconvenience to customers. The average work for one ten-hour day in cutting over to the network covered sixteen services, 90 customers, twenty polyphase motors, fifteen polyphase meters and 46 single-phase meters, 29 two-wire meters reconnected, six elevators and miscellaneous heating and cooking equipment.

Underground service cable size limitations, standardized for the existing two-phase system, were selected for the network. This avoided stocking additional cable sizes and changes in service entrance switches. Services requiring larger cables for three-phase, 208-volt network were replaced with rubber-covered wire having synthetic color coded jackets, same as secondary mains. Most service ducts into buildings are two 3.5-in. vitrified clay runs with the existing two-phase paper and lead cables in one duct, leaving the remaining duct free for new three-phase service cables in future. These were pulled in, tagged and connected to the three-phase mains in service boxes or manholes and were alive before cutting over a building to the network and were available for temporary light and power. Service cables not requiring any change in size were cut off two-phase mains in service boxes and manholes at the time of cutover, meggered, tagged and extra cable removed from the duct. Cables were then tapped into the new three-phase mains one at a time.

Cable Alive in 45 Minutes

The first 120/208-volt service cable was made alive in about 45 minutes after cutting off from the two-phase mains. This was used to serve commercial establishments and to maintain refrigeration. A large number of old cables meggered low, and on removal for inspection were found defective in many cases due to rats chewing the lead and paper down to the bare conductor.

Cable size limitations were determined on the basis of voltage drop, customers' equity in existing service cables and cost of changeover.

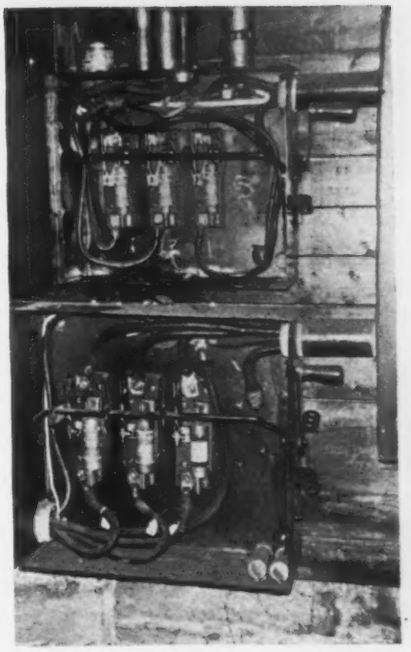
The maximum demand on single-phase, 120-volt service was set at 5 kva. and at 10 kva. on three-wire, 120/208-volt service.

Table I—Three-Phase Service Cable Size Limitations

Cable-Size	Max. Kva. per Phase	Max. Length in Feet at Max. Amp. and 1 Percent Drop	Main Entrance Switch Rating, Amp.
6	9	40	100
4	12	46	100
1/0	21.6	58	200
4/0	33	64	400
350 MCM	45	67	600
500 MCM	53	68	600

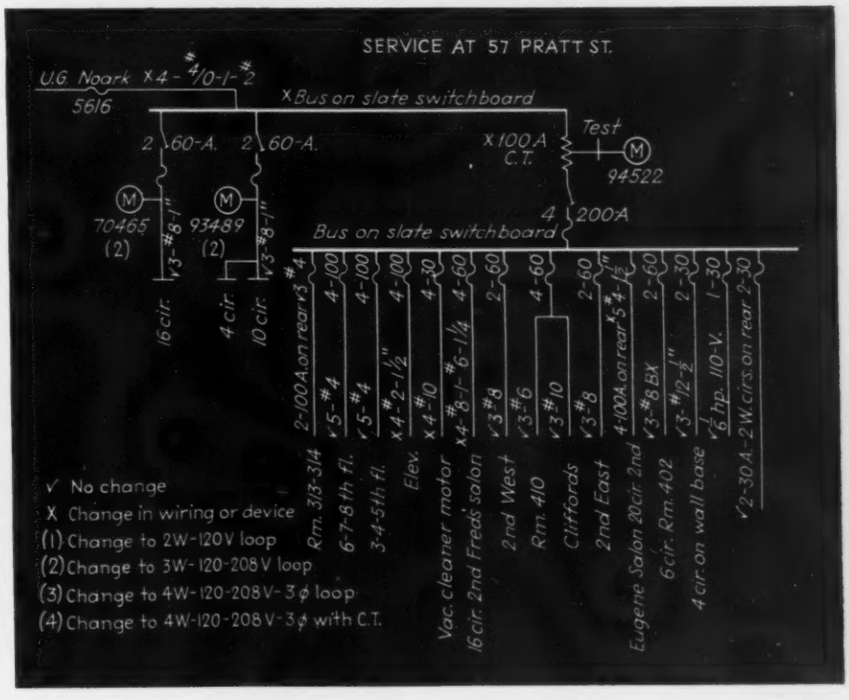
Table II—Sizes of New Meters and Allowable Demand Loads

Phase	Volts	Elements	Amp.	Demand Kw.
Self-Contained Meters				
1	120	1	15	1 to 4
1	120	1	50	3 to 12
2	120/208	2	15	2 to 8
2	120/208	2	50	6 to 24
3	120/208	3	15	3 to 12
3	120/208	3	50	9 to 36
Meters with C. T.				
3	120/208	3	2.5	4 to 15 (50 amp.)
3	120/208	3	2.5	8 to 32 (100 amp.)
3	120/208	3	2.5	16 to 64 (200 amp.)
3	120/208	3	2.5	32 to 128 (400 amp.)



TWO four-pole externally operated switches altered for three-phase service. One section of switch was removed in each case

The first year's program required the revamping of 97 services, of which eleven were changed to the next larger sized cables; 21 required change in the size of neutral cable only; 39 eliminated one cable only (five-wire, two-phase to four-wire, three-phase); four changed from sin-



WIRING diagram in schematic form
Typical sheet given to electrical contractors to facilitate estimating cost of alterations and indicating required revisions in meter loops, feeders, branch circuits and wiring devices. These diagrams, in conjunction with further details of wiring specifications, are drawn up for each polyphase service. Necessary changes are indicated in a tabulation at the bottom of each sheet.

WS NO._____ METER LOOPS DM NO._____

SHEET NO._____

CUST._____ ADD._____ LOAD_____

METER_____ PRES.LOOP_____

PROPO.LOOP_____

FORM for recording meter loop data: field sheet 8½ in. x 11 in.

CUSTOMER EQUIPMENT SURVEY SHEET

Service Address_____ Customer_____ Address_____

Present Service_____ Service Box_____ Poles_____ Rating_____

Meter Service from_____ Size_____ Wire_____ M.S.Swt._____ M.Test Swt._____

Meter No._____ Demand Kw._____ Amps._____ Wire_____ Type_____ Cur.Trans._____

New Meter_____ Max.Demand Kw._____ Amps._____ Wire_____ Type_____ Cur.Trans._____

Lighting Equipment_____ Contactor_____ Time Clock_____ Sign_____

Panels_____

MOTOR DATA

Application	Make	H.P.	R.P.M.	Amps.	Volts	Phase	Type	Frame	Serial No.	Ser.Factor	Base	Disposal

STARTER DATA

Control for	Make	Type	Size	Poles	Style	Heaters

ELEVATOR DATA

Make	Motor	Size	H.P.	R.P.M.	Permit	Switch

I agree that the above list of equipment is correct,

Customer_____ Date_____ Surveyed by_____

THE HARTFORD ELECTRIC LIGHT COMPANY

CUSTOMER equipment survey sheet: original 8½ x 11 in.

SHEET NO. 5 EQUIPMENT LIST. W.S. NO. 128

CUSTOMER WOODRIDGE CORP. ADDRESS 57 PRATT STREET METER NO. 94522

EQUIPMENT	MAKE	SIZE	VOLTS	PHASE	DISPOSAL	CIRCUIT WIRING
Vacuum	R - M	3 HP	220	2ϕ-4W	Rewind	Change to 3ϕ-3W.
Oil Burner	--	1/6 HP	110	1ϕ-2W	No change	No change
Passenger Elevator	West.	15 HP	220	2ϕ	Rewind	Change to 3ϕ-3W.

EQUIPMENT listing sheet, field size 8½ in. x 11 in.

gle to three-phase, and 22 required no change from existing single-phase. The average labor per service, cut-over only, was eight man-hours, including replacement of defective cable. The first-year program also called for revamping of 120 meter boards and meter service feeders. Ten percent required larger size, the rest having 40 to 50 percent extra capacity and needing no change. Voltage drop was considered in all cases.

Metering Changes

All existing three-wire, 115/230-volt meters had to be changed to two-element, 120/208-volt meters. The only work on the meter loop was the addition of a neutral tap for the meter potential coils. No changes in loops or meters were required in the existing two-wire metering. With three-wire, 115/230-volt meters if the demand exceeded 12 kva. the existing load was divided and balanced as closely as possible on a new three-phase meter loop. This was required to maintain a balance on service conductors and to reduce the voltage drop due to the added drop of the neutral conductor on changing from three-wire, 115/230 volts to three-wire, 120/208 volts from three-phase, four-wire feeders.

In about 90 percent of the cases existing polyphase meter loops were large enough and were simply changed to three-phase operation by eliminating one wire. Existing meter test blocks for self-contained meters were eight-pole and only required using seven poles for three-phase loops. Larger sized polyphase loops requiring current transformers and meter test switches were given individual analysis. New three-phase self-contained meters had larger capacity than the existing two-phase self-contained meters, hence about 25 percent of the existing current transformer loops were altered for three-phase self-contained meters, which saved the cost of current transformers. All meter test switches for two-phase, current transformer meter loops were eight-pole, requiring change to ten poles for three-phase current transformer meter loops. The eight-pole test switches were salvaged for use on two-phase, 4,800-volt primary vault meters.

Demands larger than those in Table II required special consideration.

The largest motor allowed on the existing two-phase self-contained meter was 10 hp. and on new 50-amp., three-phase self-contained meters is 15 hp. This should achieve savings in metering cost. Larger demand loads can be put on new three-phase self-contained 50-amp. meters than on present two-phase, 25-amp. self-contained meters. Customers' metering was revised in 541 cases.

Rewinding Motors

The motor rewinding contractor was given complete data as to nameplates, disposition, owner, date and time of changeover. He obtained spare stators for all standard-frame motors to facilitate speed of changeover. Special or old-time motors requiring immediate replacement were temporarily superseded by others pending rewinding. All overload heaters in starting equipment were replaced with the proper size for three-phase operation from this contractor's stock. Fortunately all air-conditioning motors were not in use at the time of changeover, and so time was ample for rewinding.

Each single-phase, 220-volt motor was thoroughly inspected and checked in relation to starting torque requirements, overload protection, circuit wiring size and working conditions. In the first year 98 percent of these required no rewinding. About 10 percent of all single-phase, dual-voltage motors, ¾ hp. and under, were reconnected for 120-volt operation. Worn bearings, brushes and holders were replaced for successful operation at 208 volts. In some cases cir-

[*Continued on page 147*]

Instrument Assembly Simplifies Relay Field Testing

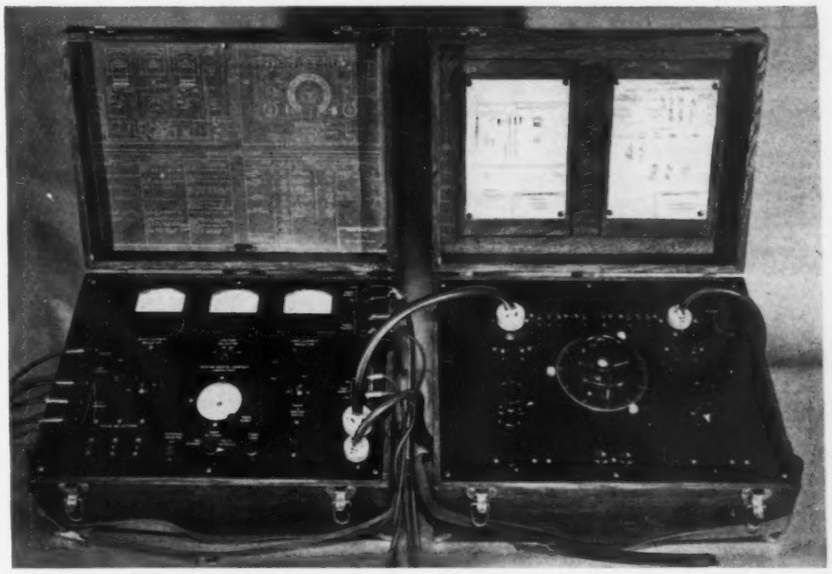
Rapid check-ups of the conditions of protective relays made with compact, portable equipment which is applicable to fourteen different types of relays and has wide current range

A. J. McCAHAN, Boston Edison Company, Boston, Mass.

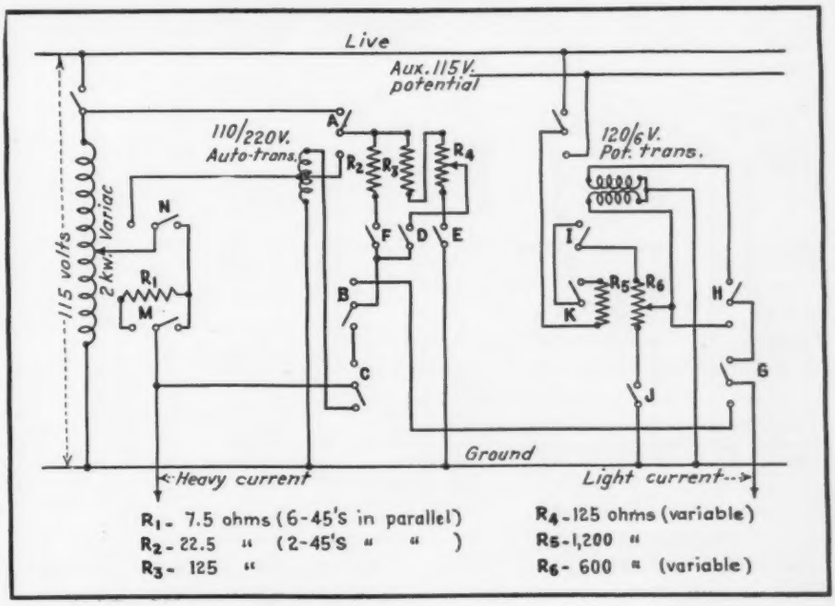
A COMPACT portable testing equipment providing the necessary facilities for making relay settings and determining their characteristics has been designed and constructed by the test and research section, engineering department, Boston Edison Company. Field relay testing on the Boston Edison system requires complete control and accurate measurement of current values between 0.4 and 100 amp., and voltages up to 250 with a wide variation of time settings. Because relays with this wide range of current and voltage are located in the same stations, the testman must be provided with apparatus to control and measure the required values. If separate instruments and control devices are used many changes of apparatus and connections must be made to complete the tests of the different relays.

A large number of units such as instruments, load boxes for control of current below 15 amp. and tapped auto-transformers between 15 and 100 amp., potential transformers and slide-wire rheostats must be maintained, transported to the station, wired and adjusted if conventional practice is followed. These objectionable factors are greatly reduced, with a consequent saving of time and the cost of instruments, by the use of the methods and equipment now adopted.

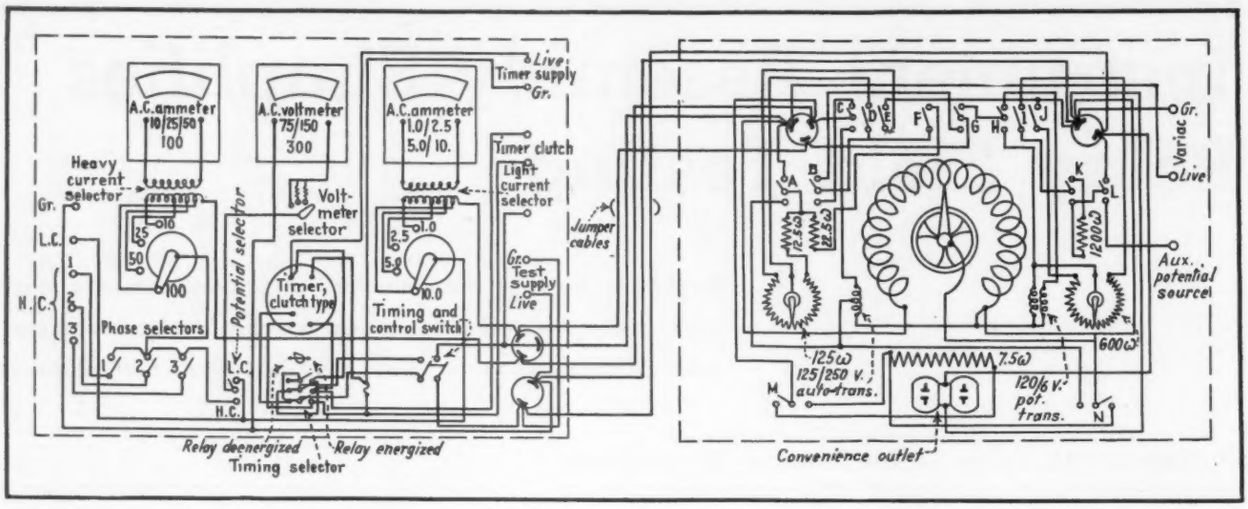
The equipment has two carrying cases, one for the indicating instruments and timer and the other for current and voltage control devices. The instrument case contains two 1-amp. flush type switchboard ammeters with suitable current transformers to provide scale ranges of 10, 25, 50 and 100 amp. for one and 1, 2.5, 5 and 10 amp. for the other. A voltmeter



CLOSE-UP of portable test equipment



SCHEMATIC design of load control case



DETAILED wiring diagram of test set

Table of Switch Positions for Various Load Conditions

Heavy Current Leads

Condition	Switch Position A	B	C	D	E	F	M	N
Overcurrent — heavy							Right	Right
Overcurrent — 0–15 amp.							Left	Left
Overcurrent — 0–21 amp.	Up	Down	Up	Open or closed	Open or closed	Open or closed	Left	Right
Overvoltage			Down					
Undervoltage	Down	Down	Up	Open or closed	Open or closed	Open or closed		Left
Normal voltage	Up	Down	Up	Open or closed	Open or closed	Open or closed		Left

Low Current Leads

Switch position	Light Current 1 amp. variable	6 amp. variable	Voltage in phase	Voltage out of phase	Low voltage 0–6
A	Up	Down	.....		
B	Up	Up	.....		
C	.....	.....	.....		
D	Open or closed	Open or closed	.....		
E	Open or closed	Open or closed	.....		
F	Open or closed	Open or closed	.....		
G	Down	Down	Up	Up	Up
H	.....	.....	Down	Down	Up
I	.....	.....	Closed	Closed	Closed
J	.....	.....	Open or closed	Open or closed	Open or closed
K	.....	.....	Up or down	Up or down	Up or down
L	.....	.....	Up	Down	Up or down
M	.....	.....	.....	.....	.....
N	.....	Left	.....	.....	.....

with 75, 150 and 300-volt scales completes the instrument requirements. A clutch-type synchronous timer is included with a double-throw switch permitting timing of relays making contact when energized or de-energized. Three single-pole tumbler switches select the desired phase of the relays under test and the main control switch supplies line potential to the loading unit, returning through the measuring transformers to the relay under test, simultaneously starting the timer.

The load control case carries a 2-kw. closed core variable auto-transformer to supply heavy current, six 45-ohm non-inductive resistors in parallel for starting current and in-

[*Continued on page 149*]

Operating Instructions for Relay Testing

Instrument and Timing			Load Control								
			Voltage			Current			Differential		
Relay Class	Timer Connections	Leads	Test	Switch	Position	Test	Switch	Position	Test	Switch	Position
Overcurrent and overvoltage	Timer supply from aux. 110 v. source Clutch leads to relay contacts Timer switch to right	Heavy current and ground leads to relay Ammeter or voltmeter as desired	Timing	C	Down	Timing	M	Right	Transformer	A	Up
			Overvoltage & Pickup	N	Left	Heavy current	N	Right	Differential with heavy diff. current	B	Up
						Timing	M	Left		D	Closed
Undercurrent and undervoltage	Timer supply from aux. 110 v. source Clutch leads to relay contacts Timer switch to left	Heavy current and ground leads to relay Ammeter or voltmeter as desired	Timing	A	Down	Light current & pickup	N	Right		E	Open or closed
			Undervoltage & Pickup	B	Down					F	Closed
				C	Up	Timing	A	Up		G	Down
				D	Closed	Light current & pickup	B	Down		N	Left
				F	Closed		C	Up		N	Right
				N	Left	15 to 20 amp.	D	Closed	Generator Differential with light diff. current	A	Up
Transformer differential	Same as for overcurrent	Heavy current lead to diff. coil Ground lead to 10 amp. sum coil Light current lead to 5 amp. sum coil	Timing	A	Up		F	Closed		B	Up
			Normal voltage	B	Down	All above use	M	Left		D	Closed
				C	Up	H.C. ammeter	N	Right		E	Open or closed
				D	Closed					F	Open
				F	Closed	Timing	A	Down		G	Up
Generator differential	Same as for overcurrent	Heavy current lead to 5 amp. sum coil Ground lead to other 5 amp. sum coil Light current lead to diff. coil	Timing	A	Up	Light current & pickup	B	Up		M	Left
			Reduced voltage	B	Down		D	Closed		N	Right
				C	Up	0–6 amp. using L.C. ammeter	F	Closed			
				D	Closed		G	Down			
				F	Closed		N	Left			
				G	Up						
				H	Down						
Impedance and directional potential element	As called for dependent on relay class	Voltage on light current lead		I	Closed						
				K	Up or down						
				L	Up						
				N	Left						
Circuit breakers and circuit opening relays	Timer supply from aux. 110 v. source Top clutch lead to relay or breaker with other side grounded Fuse removed from timer circuit Timer switch to right	D.C. control for breaker across control switch as shown on drawing Timer leads only other leads connected For relays — same as for overvoltage or overcurrent		G	Up						
			Potential elements of impedance and directional relays	H	Up or down						
				I	Closed						
				J	Open or closed						
				K	Up or down						
				L	Up or down						

Criteria for Reclamation of Insulating Oil

Deterioration test limits and reclamation methods — Possibilities of fuller's earth not completely explored — Activated alumina for continuous maintenance

M. C. WESTRATE and J. A. PETERSON, Commonwealth & Southern Corporation, Jackson, Mich.

TRANSFORMER and circuit breaker oil may eventually reach the stage where purification by the usual methods of centrifuging and filter press treatment are not adequate as these remove only the moisture, carbon and sludge. Oil exposed to air and heat also has formed within it an organic acid which reduces the resistance to emulsification and allows moisture to remain in suspension. This acid condition gets progressively worse and cannot be removed by the centrifuge and filter press treatment, but requires an additional process of neutralization or removal. Oil subjected to transformer or circuit breaker failure, or extremely severe, or long service, is particularly likely to require additional treatment before it can be used again.

Insulating oil, as generally used in transformers, regulators and circuit breakers, is a light colored, sometimes colorless, mineral oil which should have the following properties:

(a) High dielectric strength.

(b) Freedom from acid or alkali and elements that are harmful to the insulation or conductors.

(c) Low viscosity to provide good heat transfer.

(d) Good resistance to emulsion so that any materials, especially water entering the oil, will not be held in suspension, but will settle or separate from the oil.

(e) Freedom from sludging under normal operating conditions.

Oil Deterioration

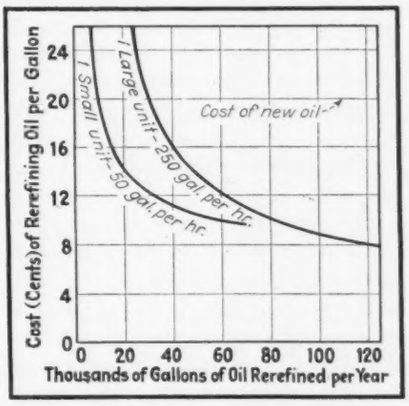
Oil deterioration or the changing of some of the foregoing properties may be due to the following causes:

(a) Water which may enter in various ways despite very careful handling and operation.

(b) Oxidation due to exposure to air and heat, causing sludge formation, and the gradual formation of organic acids which decrease the resistance to emulsification.

(c) Carbonization in oil circuit breakers due to arcing.

(d) Improperly dried or incorrect type of insulating varnish.



APPROXIMATE COST of reclaiming insulating oil. Rerefining economical where more than 10,000 to 30,000 gallons are to be treated per year

Oil Test Methods

Dielectric Test—Water in small quantities, ten parts in a million of oil, will reduce the dielectric strength of good oil from 35 kv. (standard 0.1 in. test) to 21 kv.; twenty parts of water will reduce dielectric strength to 16 kv., etc. The standard test procedure is described in American Society for Testing Materials Publication D48-33, and consists of breaking down the oil in a cup having two one-inch brass or copper disks, separated one-tenth of an inch.

Acid Test—The acidity of an oil may be determined by a neutralization test using potassium hydroxide as described in the ASTM Tentative Standard designated as D188-27T. When the neutralization number as defined in this standard exceeds a predetermined value, the oil should be purified by other methods in addition to the centrifuging or filter press methods. If an oil has a neutralization number of 0.6, it means that 0.6 mg. of potassium hydroxide is required to neutralize the acid in one gram of oil.

Sludge Formation

The resistance to emulsion test is seldom used, but if desired can be determined as described in the ASTM Standards by the test designated as D157-36.

Sludge Formation — Oxidation is not appreciable in those transformers in which the oil is not exposed to air, but, where transformer oil is exposed to air, sludging and acid formation may be expected.

There are no standard test methods as yet for determining the sludging characteristics of oil.

Carbonization—The usual method of determining carbonization is by visual inspection. Color charts may be used where all the oil inspected is of similar type, making the inter-

pretation of the color of consistent value.

Minimum requirements for oil beyond which reconditioning or replacement is desirable are as follows:

1. Dielectric strength, 17 kv. (standard test method).
2. Acidity: (a) Transformers, 0.9 mg. KOH per gram of oil; (b) Oil circuit breakers, 1.5 mg. KOH per gram of oil.

Sludging Point

It has been calculated that transformers which are heavily loaded may reach the sludging point of 0.5 KOH in 1.6 years if of breather tank type, 4.1 years if of the expansion tank type and 67 years for the inert air type, assuming that the latter two types are properly maintained. These figures can probably be doubled for the limit of 0.9 KOH.

Before oil is placed in service, whether taken from tank cars or storage tanks, it should be tested for dielectric strength to determine if centrifuging is required before placing in the apparatus. The pipe lines and tanks used for the handling of clean oil should be thoroughly cleaned and flushed out with oil so as to be free from moisture as a small amount of condensation may seriously reduce the dielectric strength of the oil. A rubber hose should not be used because of the sulphur content. Metal hose or hoses made of synthetic rubber-like materials are suitable. As a final check the oil in all apparatus should be sampled and tested before such apparatus is put into service. New oil should test at least 30 kv. and should not exceed 0.05 mg. KOH.

Methods of Reclaiming Oil

The methods used for rerefining oil include various processes, generally using fuller's earth (a clay found in Georgia and California), together with some chemical to counteract the acid. A new method using activated alumina is being used by some companies for the maintaining of oil in transformers.

One method using fuller's earth consists briefly of the following steps: Oil and activated carbon are pumped into the mixing tank, heated and thoroughly agitated. The mixture is then centrifuged to remove free water and solids. The oil is then reheated and mixed with a second reagent, sodium silicate, and again centrifuged. After again being reheated, the oil is mixed with fuller's earth and agitated and then centrifuged for final clarification.

Another method used in small portable equipment consists of first mixing the oil with fuller's earth and agitating. The mixture is then pumped into a retort, where it is heated and sodium hydroxide added. While in the retort the oil is washed with steam to remove excess sodium hydroxide and the vapors withdrawn with a high vacuum. The mixture is then passed through filter papers on which a cake of fuller's earth is formed. After this the oil is cooled and passed through a glass filter to remove any part of the filter paper or cake which might have broken off. A larger-sized portable equipment is similar, except that a special vacuum type oil purifier with filter press is used.

Power Requirements

A factor to be considered in either of the above methods is the power required for the heaters and motors, which is about 30 kw. for the smallest unit and about 90 kw. for the largest. This is particularly important in considering the adaptability of portable equipment, since only the largest substations are usually equipped with station power transformers of this capacity.

One company offers only a filter-press using fuller's earth in the form of a filter-cake formed on the blotters. Only about 9 lb. of fuller's earth is used per charge, which means the blotter papers and filter-cake must be changed frequently. The manufacturer recommends this at about every 400 gal., depending on the acidity. It is claimed that this process reduces the acidity of the oil, but it is doubtful whether any large amount of acid could be removed since no neutralizing agent is used other than the small amount of fuller's earth. This method has been used to only a limited extent in the field. The equipment was originally developed for use with synthetic oil.

Activated alumina (Al_2O_3) is a highly porous, hard, durable granular substance with adsorptive properties which are effective in removing acid from oil but not sludge. Since this is a physical process requiring slow, thorough penetration of the granules, it is best adapted to continuous maintenance of transformer oil. This may be done by placing bags of activated alumina in the transformer case or mounting a tank containing bags of activated alumina on the transformer case and circulating the oil through it. The saturated activated alumina may be recovered by heating in a ventilated retort or oven at a temperature of 350-600 F.

Economics of Oil Reclaiming

The economics are dependent on the quantity of oil requiring replacement or rerefining per year and the transportation involved. For properties covering considerable area and having a relatively small amount of oil to replace the use of portable equipment has been assumed in preparing the curves in the accompanying illustration. A factor which does not readily lend itself to evaluation, but which should be considered, is the availability of power supply at the various stations.

In determining the quantity of oil to be rerefined, consideration should be given to the amount lost through tank failures and that discarded in small quantities which would require excessive handling to salvage. Also, the amount lost in processing may run as high as 10 per cent.

The rerefining of oil has been of recent development and to date limited generally to metropolitan companies utilizing large quantities of oil. The practicability of individual operating companies rerefining oil can be seen from the accompanying chart considering the quantity of oil which it would be possible to salvage. For example: If new oil costs 20 cents per gallon, it would probably not be practical to invest in rerefining equipment unless at least 20,000 or 30,000 gal. could be salvaged per year. Where such equipment is not justified, consideration might well be given to the use of activated alumina on transformers which have shown a rapid deterioration with increased acidity of the oil. Also, further field data on the effectiveness of the fuller's earth treatment without chemicals should be obtained as this method is relatively inexpensive as far as investment is concerned and might be adapted to present filter-press equipment.

While it is doubtful if this method can reduce acidity to any large degree, it might prove sufficient for moderately acid conditions or for oil circuit breakers.

How to Apply New Street-Lighting Code

By F. VICTOR WESTERMAIER*

THE DIFFERENCE between seeing in the daylight and at night makes it necessary to provide street lighting of a character that will be helpful in avoiding accidents under extremely low illumination intensities. Night visibility must be of the order to give the traveling motorist and the pedestrian a true picture of confronting conditions in time to make decisions for avoiding collision.

This is taken into account in the traffic classification of streets by the new I.E.S. "Recommended Practice of Street Lighting—1940" and for each classification minimum illumination values are specified. In addition, provision is made for the modification of these values to meet the special requirements of streets according to their character and use.

Special Considerations

Brightness of street surfaces and the surroundings combined with the contrasting brightnesses of objects constitute the basis of the approach to traffic safety lighting. These must and can be obtained efficiently and with a minimum of discomfort glare from the illuminants used.

Consideration therefore must be given in every case to the reflective qualities of street surfaces and abutting structures because brightness is an essential criterion.

Intersections and curves require special consideration. Traffic engineers recognize the hazards to life and property at street intersections where the conflict of "cross" and "turning" traffic causes confusion and accidents. The recommendations provide that, as an absolute minimum, the illumination at the average rectangular or diagonal intersection should equal the sum of the illumination values required for each of the intersecting streets. Also, that where intersections are particularly wide and complex the illumination may have to be raised in multiples of these values. Furthermore, the lighting pattern of the intersection units should be such as to provide vertical illumination high enough to render pedestrians and other objects clearly discernible.

Good practice calls for a relatively closer spacing of units on the outside circumference of curves, also that the use of a light distribution pattern to give an increased surface brightness throughout the width and length of the curve produces enhanced visibility at dangerous turns.

With essential features of the "Code" outlined, let us take, for example, the problem of revamping the lighting of the traffic streets of a city:

Step No. 1—From the traffic engineer's "spot" map are obtained the streets and locations where night accidents occur.

These streets with the scaled distances covered by accidents during twelve months are tabulated, together with the traffic counts taken during the hour of maximum night travel.

Step No. 2—According to the traffic count rearrange the lists in the order as classified in Table II, page 21 of the "Code," and for each tabulated location give the generated lumens now used per linear mile, or per 1,000 ft., of street. Then in an adjoining column insert the generated lumens required by the recommendations according to traffic density. This factor can be obtained from a chart (next page) co-ordinates of which are "Vehicles per Hour" and "Generated Lumens Required per Mile," (or per 1,000 ft.) A fairly close approximation in generated lumens per linear mile to the "foot-candles per square foot" requirements in Table III is obtained with modern luminaires, by using the following values as consecutive points on the charted curve:

Vehicles per Hour (Maximum Night Hour)	Generated Lumens Required per Mile
150	100,000 lumens
325	140,700 lumens
850	253,450 lumens
1,800	633,600 lumens

Step No. 3—Rearrange the tabulated lists as made in Step No. 2 in order to apply the modifications in illumination values required for character and use of streets as shown in Table IV, page 22.

Step No. 4—Lay out a tentative plan for each street on lamp maps in accordance with the data obtained in the preceding steps, and the recommendations for mounting heights, spacings and arrangement of units as given in Tables I and V. Provisions for lighting street intersections and curves should receive careful planning.

Step No. 5—Survey each street with the plan to check local conditions not shown on the maps, including the reflective character of street surfaces and surroundings, locations of private driveways, trees, posts, and poles of all kinds, also churches, theatres and other places where more than average pedestrian congestion is anticipated during the hours of darkness. The survey should also indicate to the engineer just where concentrating, semi-concentrating or diffusive types of distribution should be used to obtain the best visibility results under the conditions presented.

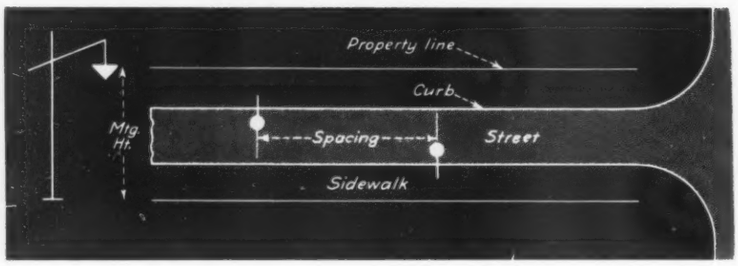
By taking the steps suggested, or modified as may seem desirable, the provisions of the "Code" will be met.

* Mr. Westermaier was chairman of the 1940 I.E.S. committee on street and highway lighting which prepared the new "Code," the first printing of which was in January this year.

Recommended Street-Lighting Practice — 1940 I.E.S. Code

TRAFFIC STREETS

Values based on luminaires mounted over roadway —higher values for luminaires back of curb line



Very Light Traffic
(Under 150 vehicles/hour)

Lamp Lumens	Mtg. Ht. (Ft.)	Spacing (Ft.)
1,000	15	90-110 stag.
2,500	20-22	130-170 stag.
4,000	25-30	200-250 cen.

Av. foot-candles 0.1, Minimum 0.02
Av. foot-candles sidewalk 0.05

Light Traffic
(150-500 vehicles/hour)

Lamp Lumens	Mtg. Ht. (Ft.)	Spacing (Ft.)
2,500	16-18	100-120 stag.
4,000	20-25	130-170 stag.
6,000	22-25	130-170 stag.

Av. foot-candles 0.2, Minimum 0.05
Av. foot-candles sidewalk 0.05

Medium Traffic
(500-1,200 vehicles/hour)

Lamp Lumens	Mtg. Ht. (Ft.)	Spacing (Ft.)
6,000	20-25	100-120 stag.
10,000	22-27	130-170 stag.
15,000	25-30	130-170 stag.

Av. foot-candles 0.4, Minimum 0.1
Av. foot-candles sidewalk 0.1

Heavy Traffic
(1,200-2,400 vehicles/hour)

Lamp Lumens	Mtg. Ht. (Ft.)	Spacing (Ft.)
10,000	24-28	100-150 opp.
10,000	24-28	75- 90 stag.
15,000	24-28	150-180 opp.

Av. foot-candles 0.8, Minimum 0.2
Av. foot-candles sidewalk 0.25

Very Heavy Traffic
(2,400-4,000 vehicles/hour)

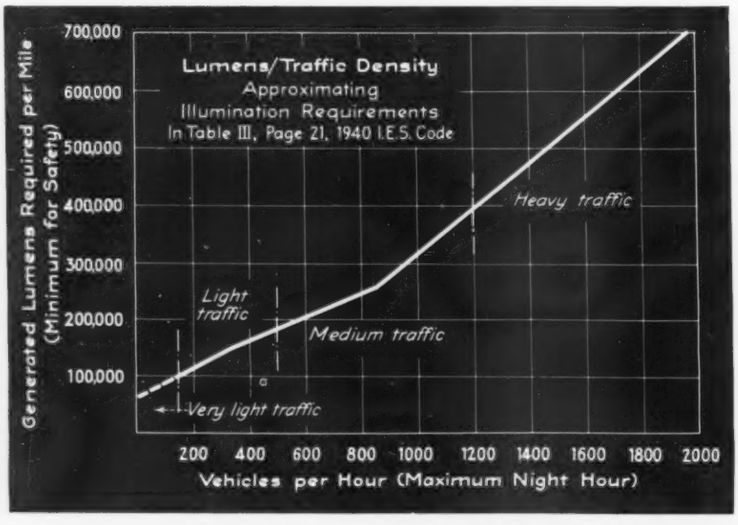
Lamp Lumens	Mtg. Ht. (Ft.)	Spacing (Ft.)
15,000	25-30	100-150 opp.

Av. foot-candles 1.2, Minimum 0.3
Av. foot-candles sidewalk 0.25

Heaviest Traffic
(Over 4,000 vehicles/hour)

Lamp Lumens	Mtg. Ht. (Ft.)	Spacing (Ft.)
15,000	25-30	100 opp.

Av. foot-candles 1.5, Minimum 0.4
Av. foot-candles sidewalk 0.25



Residential Streets

See very light traffic streets.

Business Streets

Minimum levels never less than average foot-candle values for streets carrying same volume of traffic. General character surroundings, pedestrian use, parking and other factors influence higher levels.

Industrial Streets

See very light traffic streets.

Boulevards and Park Drives

Same levels for streets with same volume of traffic. For divided streets (boulevard) determine lighting for each roadway separately.

Intersections

Illumination at average rectangular or diagonal intersection to be at least equal to sum of levels of two streets forming intersection. For complex intersections use heavy traffic values.

Alleys

Where used for vehicular traffic, 1,000-lumen lamps, 200 ft. or less spacing. Lighting at entrances, exits and intersection of public alleys.

Bridges, Overpasses and Viaducts

Level same as for streets carrying same volume of traffic. Never less than level of streets with which they connect. Separate lighting for pedestrian walkways. Light roadway abutments at both ends. Special attention to variation in curb contour or roadway width.

Plazas and Traffic Circles

Levels never less than for streets carrying same volume of traffic. Pedestrian exposure and local conditions may cause increase of 50 percent or more. Special attention to lighting of ingress and egress roadways.

Elevated and Depressed Express Roadways

High levels—never less than streets with same traffic volume. Light units to denote ramps, curves, variations in roadway width and curb contour.

Underpasses and Tunnels

Level in underpasses 50 percent or more above that recommended for connecting street—provide for footways, roadway impediments and hazardous approaches. General illumination for tunnels same as underpasses. Tunnel daytime approach lighting 100 ft.-candles at entrance, gradually tapering down inside to general level.

These data (taken from 1940 I.E.S. Code) represent values for average conditions. Character of pavement, width of street, foliage and other local conditions will modify final results. Prepared by "Electrical World" staff.

Commercial Sales Grouping Yields $20,000 per Year

Wisconsin Electric Power adds 1,200 kw. per year of commercial cooking-baking at cost of only 31 cents per dollar of E. A. R. — Analyzes customers' operations for group selling

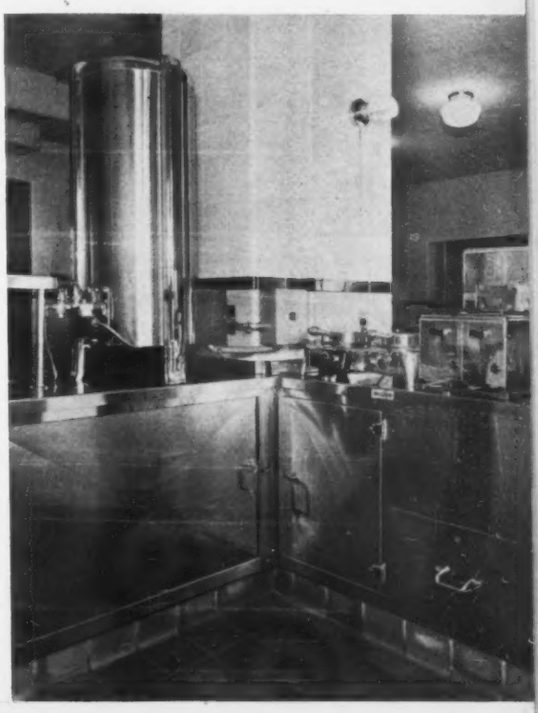
WALTER A. KANT, Wisconsin Electric Power Company, Milwaukee, Wis.

WELL-PLANNED group installations of commercial cooking equipment are resulting in more satisfactory results for our customers and for our company as we are adding 1,200 kw. per year yielding $20,820 in new revenue at a cost of only 31 cents per dollar.

Before electric cooking gained the acceptance it now enjoys, our promotion efforts in the commercial cooking and baking field were largely confined to placing individual electric appliances wherever sales could be made. The result, we discovered, was that the customer too often judged the success of the appliance entirely by its operating cost in comparison with that of corresponding fuel-fired equipment. More recently we have directed our promotional efforts toward the sale of carefully selected groups of equipment rather than individual units, and results now indicate that we are doing a much better job both for the customer and for ourselves.

This effort toward securing well-planned group installations developed as we observed that the average restaurant was usually not arranged for economy in labor costs, promptness of service, nor attractiveness, and that the profits of many restaurant operators were often far below the possibilities in their respective localities. This seemed especially so in the case of short-order restaurants with separate kitchens, and in many places the recognized advantages of electrical over gas appliances were not fully realized due to haphazard arrangements and their operation alongside fuel-fired appliances.

In a factory equipment is placed in such a sequence as to reduce to a minimum the movements of both material and workers. In the average restaurant the old appliances and methods are just taken for granted and food preparation is carried on as it was a generation ago. The restaurant represents a field in which modernization has lagged behind, but with the modern cooking and baking equipment now available the way seems open for extended promotional effort planned to bring out by "redesigning restaurants" greater overall benefits of electric cooking.



BY ADDING 73.5 kw. to its lines Wisconsin Electric gains an annual usage of 60,000 kw.-hr. per year from this rural commercial customer (1) by studying customer's service needs and (2) by setting up three separate all-electric sections designed to meet those needs; right, above, coffee, toast and waffle department; below, left, bakery section; below, right, cook's section with range, warmer and fryer

GOOD for $300 per year—this compact modernized restaurant profitably employs 16,000 kw.-hr. per year costing only $300, yet operating ten separate commercial applications

LOOKING for a second electric restaurant—this Wisconsin Electric customer, now using 21,000 kw.-hr. per year, finds utility recommendations triple business and reduce expenses; he wants to open a second electric restaurant

To undertake such a program of restaurant modernization it is obvious that a good working knowledge of both restaurant operation and of merchandising is necessary. One must understand effective merchandising practice, be able to visualize the possibilities of business locations and be able to present plans and specifications along the lines of the most modern, attractive and efficient arrangement each situation permits. To begin with, we informed ourselves concerning the operating methods and equipment found in the most successful restaurants both in our own locality and in other cities and studied the restaurant operator's typical problem, learned to speak his language and accumulated pictures and plans of successful installations.

In this "Restaurant Planning" method of selling we contact mostly restaurant operators who are contemplating changes and those who, we think, could most benefit from modernization. With such operators we discuss the advantages which more successful operators have obtained with their modern equipment and show them successful installations in operation.

Many operators, we have found, are primarily interested in how the electric service cost for an all-electric restaurant will compare with their present fuel cost. This opens the way for analysis of the real advantages of a well-planned restaurant; *i.e.*, quicker service, more meals served per unit of space, less labor cost per meal, greater popularity and greater profits. The cost of electric service becomes scarcely a factor.

What may be really important is the space and labor saved by moving the griddle, broiler and French fryer out of the kitchen and, possibly, setting them on top of a counter type of refrigerator, using an electric food warmer in place of the well-named "steam table," and making it not only more efficient but also more attractive so that the new all-electric restaurant becomes the talk of the neighborhood.

With the co-operation and assistance of electrical contractors and restaurant equipment dealers we eventually put into the restaurant operator's hand blueprint plans, lists of equipment and estimates of cost of electric wiring and the proposed electric appliances. From this point many have proceeded with the modernization of their restaurants and have profited thereby.

This type of promotion is necessarily slow at first and takes a great deal of effort, but we believe that it will secure progressively greater results. As examples, we present the following:

Customer "A"

This customer operates a private hospital in a rural area. Meals are prepared regularly for about 100 patients. Three sections of coal range represented the cooking and baking facilities. All the cooking, roasting, coffee and toast making, as well as some of the baking, was done with this range.

In 1939 the coal range needed extensive repairs. We interested the customer in the possibilities of specialized electrical equipment, properly selected and installed. Just to replace the fuel range with electric ranges of corresponding size would not, we were sure, solve the real problem. The congestion around the kitchen range would not have been reduced and the operating cost would probably have increased. After much planning and study, building changes were made and carefully selected groups of specialized equipment were installed, as illustrated.

It is to be noted that the bakery is in a separate room and completely equipped for the baker's needs. A separate coffee, toast and waffle section is provided in a suitable location. Two sections of electric range, a dish- and food-warming table and a French fryer become the cook's section. There is also a separate pantry for salads, ice cream and pastry, with ample refrigeration for each section. The new tile floor, the light enameled walls and stainless steel tables and cabinets complete this all-electric installation.

The management and employees take pride in their food department and all are enthusiastic boosters for the all-electric kitchen. The cost of electric service for all cooking, baking and refrigeration requirements is about $110 per month, even though more meals are now served than formerly, an average of about 1.2 cents per meal.

Customer "B"

This customer operates a small restaurant serving a mixed residential, commercial and industrial district. The seating capacity was 60 and the food was prepared in a separate kitchen. The restaurant had remained practically unchanged for 21 years and during recent years the operator struggled to make ends meet.

A year ago the customer was prevailed upon to remodel and to substitute modern electric equipment for the old. For this he spent $2,400. Half the original space is now a coal dealer's office, cutting rent in half. Most of the food is prepared on the back counter and the balance in a much smaller kitchen. The seating capacity is now 40, but due to promptness of service there is no congestion in spite of the fact that business has doubled. The customer is now at the point of adding a few odd items of electric counter appliances to meet the increasing volume of business.

He claims that business is now profitable and is an enthusiastic booster for the all electric plan.

Customer "C"

For several years this customer has operated a table service restaurant with a seating capacity of 40 and we had on several occasions discussed with him the advantages of remodeling and modernizing it.

A year ago a fire put an end to the old arrangement and the customer then rebuilt and re-equipped his restaurant according to our recommendations. A view of the new restaurant using 21,000 kw.-hr. per year is shown. The seating capacity is now fifteen, but at that the volume of business is now nearly three times as great as formerly. For the kitchen space vacated, the customer now also collects rent.

Here's another proof of the value of attractive and time-saving installations. The customer is so pleased with the result that he is now looking for a suitable location for future electric restaurant No. 2.

Customer "D"

This customer recently accepted our recommendations and provided himself with a more modern and more profitable restaurant. The type of service is similar to what it was before, but with a more compact arrangement. The seating capacity was increased by 10 by eliminating the kitchen. Meals are served more promptly and the food is of improved quality. This customer also realized an increase in volume of business over what he formerly had.

Customer "E"

This customer formerly operated a typical second-class hamburger stand. Business was poor and it became a case of making some worth-while improvement or discontinuing business. Improvements were made two years ago and the result is a rather attractive small restaurant.

The more attractive appearance and the better and prompter service now possible are bringing about a greatly increased volume of business. Employees find their work pleasanter and the owner has just completed paying, out of earnings, the $4,700 which he expended for remodeling.

Added Revenue

The electrification of the restaurants of these five customers has, of course, been of advantage also to the utility. The connected loads, the energy consumptions per year and the annual revenues for cooking, baking and refrigeration are as follows:

	Kw.	Kw.-Hr. per Year	Annual Revenue
Customer "A"	73.5	60,000	$1,320
Customer "B"	14.0	14,000	300
Customer "C"	20.0	21,000	420
Customer "D"	14.7	16,000	300
Customer "E"	21.0	18,000	360
Totals	143.2	129,000	$2,600

Our promotional work is carried on by two full-time men. During 1940 1206 kw. of cooking and baking load was obtained representing an estimated annual revenue of $20,820. The direct cost of securing this load, including salaries, bonuses and expenses, amounted to about 31 percent of the estimated annual revenue.

Estimate Secondary Loads From Customer Kw.-Hrs.

[*Continued from page 33*]

With definite and accurate load information, transformers can be located at the point of maximum load concentration and can be loaded to the maximum limits without having to allow a margin for unknown loads and the element of guesswork.

An example of a secondary-system design worked out by this method is shown in Fig. 3. This example indicates how sizable the error would be in assuming that each three-wire service signified a range installation and was responsible for the same demand on the system. The transformer location, if based on the number of service connections only, could easily miss the pole of maximum load concentration with unnecessary voltage drop as a result.

Results Confirmed

It might be of interest to mention the use that is being made of this system of estimating and the experience in transformer load testing by the Washington Water Power Company. For many years there has been a regular schedule of checking the load on distribution transformers through the means of recording strip ammeters, some 400 transformers having been tested yearly. For the past three winters, in addition, several sets of Maximeters and recording thermal ammeters have been used throughout an average of 100 testing days per winter season. Some experimenting was done with spot checking with indicating clamp-on ammeters, but this proved to be so unreliable that it was not put into general practice. All the maximum demand tests are made over a single 24-hour period and the charts are read for the highest average half-hour load in that period. As Maximeters provide an average reading of about the same length, the data are comparable.

Numerous tests seem to indicate that the chances of attaining the peak-load value of the maximum day, on any other day in the 100-day testing period, which consists only of weekdays and excludes Saturdays, Sundays and holidays, are about as shown in Fig. 4. This curve represents an average transformer supplying more than ten customers having fairly heavy range and water heater saturation, and it is to be expected that load tests on a large group of only lighting customers would be somewhat more consistent and that load tests involving a group of only a few customers would tend to be even less in agreement. It is obvious that transformer and secondary design should be made for recurrent peak loads and not for a value reached only once or twice a year, but what is a recurrent load—is it one that reoccurs on 10, 50 or 100 percent of the weekdays? Which test value would be the correct one to use in limiting transformer loading to, say, 140 percent?

In an attempt to obtain more definite answers, many companies are going to 48-hour testing periods, and it was in the hopes of providing a still more accurate means of transformer load determination that the kilowatt-hour method of load estimating was developed. This method has now been under fire for three winters, during which time it has been used extensively and thoroughly proven. It has been checked against hundreds of individual meter tests and numerous load records that have been run over many consecutive days on the same transformers. Not only do the estimates of urban load, from the poorer class to range saturations as high as 80 percent, prove to be consistent and dependable, but a fairly true picture is also obtained of rural loads. The estimated value is equivalent to a 30-minute demand that hits somewhere near the 90 percent point in Fig. 4, or one that can be expected on about 20 percent of the weekdays. This value appears to be a reasonable compromise and one that can be used for consistent, economic secondary design.

To Know Is to Understand

Scope and effectiveness of employee information and training program are self-enlarging in organization plan that encourages and fosters the expression of individual ideas

W. J. AMOSS, New Orleans Public Service, Inc.

REALIZATION of the need for the development of some effective means to promote better understanding between all of the various employee groups of New Orleans Public Service clearly demonstrated that a problem existed which urgently required solution. A thorough study of the problem resulted in the development of a solution in the form of a completely revised plan of personnel training activities which was designated as the "Employee Information Program" and was inaugurated in the summer of 1939. The program is designed to provide suitable facilities for the free interchange of thoughts and ideas and to permit a direct flow of information to all departments from the management and, conversely, to the management from the departments.

The 3,000 members of Public Service, engaged in the work of providing electric, railway and gas services to the people of New Orleans, represent a wide cross-section of occupations varying from unskilled labor to specialized accounting, engineering and law. These varied needs made it necessary that the program contain an effective method for the interchange of information among all classes of employees.

Program Organization

Two distinct phases of the problem were recognized in the early stages of the program's development. One involved planning, directing and conducting the activity; the other demanded the establishment of an effective means of direct continuity between the levels of management and supervision, and all other groups. Establishment of the conference method of discussion seemed indicated as the most desirable method of successfully carrying on the program.

The program is intended to include every member of the organization and to provide an opportunity for all employees to enter into the group discussions. These conference groups are organized in the following manner:

1. General committee.
2. Departmental committees.
3. Employee groups.

Composed of eighteen executives and department heads, the general committee handles the planning and direction of the program, including the determination of policies and procedures for carrying on this activity. This committee discusses relevant information that may come up the line and analyzes current situations to determine what should be brought to the attention of the whole organization. The chairman of this committee, which meets once a month, is the president of the company.

Departmental committees are composed of division heads, supervisors and key men, with the department head as chairman of his group. The members of these committees are known as the conference leaders of the employee groups. Bi-monthly meetings of these groups are held, prior to the employee meetings, and subjects which will be used as discussion material in the conferences of the employee groups are taken up, with a view to giving the conference leaders the basic information which they will later need to conduct employee meetings.

Conference leaders are the key people in the operation of the program, and upon them and their work depends its ultimate and continuing success. They must be able to conduct the meetings of their group in such a manner that every member will benefit concretely from the discussions, and they must also be able to interpret information clearly and logically to the members of their discussion groups. It is essential that conference leaders be thoroughly familiar with discussional material so that they will be prepared to pass the information on to the members of their groups. To assist the conference leaders in this, supplementary information in the nature of suggestions for conducting each meeting is supplied to each conference leader in written form.

Employee Conference Groups

Employees in each department are organized into round-table conference groups of approximately twenty persons each. These groups hold bi-monthly discussional meetings, in which every member of the organization is encouraged to participate, thus giving him an opportunity to contribute his thoughts and suggestions on the topic of the meetings or any other pertinent subject. Discussion is, of course, at all times under the guidance of the conference leader.

Co-ordination of this employee activity is a function of the advertising department, which, in addition, is responsible for the development and distribution of all material used in the program and is the point of contact for all departments concerning details of the program.

Shortly after the inauguration of the program a questionnaire was distributed to every employee, giving

each an opportunity to submit questions, suggestions and criticisms about the company. Although handled on a voluntary basis, a large volume of replies was received. More than five thousand questions and suggestions, covering many different phases of the company's operations and policies, were turned in by employees.

As a practical means of answering these questions it was decided to develop a series of booklets based on an outline of topic covered by the questions. Because of the comprehensive scope of these topics it is expected that by the time the completed series of booklets has been discussed in the employee conference meetings all members of the company will have a well-rounded, understandable picture of company operations, practices and policies. Six booklets have been developed to date, as shown in the accompanying exhibit.

Questions arising in the meetings which the conference leader is unable to answer are included in the "Record of Meeting" of the group and a copy of which is sent to the advertising department. All questions thus received are in turn transmitted to the departments and individuals best qualified to supply each answer. Answers are then returned to the group in which the question was asked.

Training Supervisors, Foremen

A most important aspect of the company-wide program of employee information and training is the supervisors' conference program. Since the supervisory employee is the point of contact between management and worker he is in an ideal position to interpret and to present employee problems to management and management problems to employees. He has, consequently, the opportunity and the obligation both to the workers and to the management to help each to understand the other. It is obvious, therefore, that he must be specially trained to understand and discharge these responsibilities in an efficient manner.

Up to the present time this supervisors' conference program has consisted solely of discussions of general topics of specific interest to supervisory employees, such as teamwork, safety, leadership, mutual understanding and training and develop-

[*Continued on page 150*]

THE TOOLS for employee information and training

Editorials

S. B. WILLIAMS, *Editor*

Unified Power Control for Defense

A NEW POWER AUTHORITY has stepped into the picture—a special power unit of OPM which will have full responsibility to handle all defense power problems. Since power is the one universal raw material of defense, it is time that full authority was concentrated in one place that had no other interest but to hasten the defense program. This action should reduce considerably the confusion that comes from uncoordinated regulation.

The industry should accept this move as constructive, for it takes power planning, for the time being at least, out of the hands of Mr. Ickes, who has wanted to be the czar of the power industry. Furthermore, the new power unit head is adding to his staff some of the best forecast analysts in the power industry. This in itself is an assurance that any planning for future power expansion will be based upon estimating procedures that have long been recognized by the power industry as sound.

The announcement last week by FPC of an expansion program through 1946, though detailed by station and units, is to be taken more as an indication of the possible scope of the program for added capacity than actual installations to be ordered. It has been felt for some time that action should be taken to prevent any diminution of land turbine manufacturing capacity. The encroachment that is feared is, of course, the Navy. Less mental disturbance on the part of FPC and the manufacturers, it seems to us, might have resulted had the Navy and FPC jointly arrived at an allocation of factory space between water and land units.

Although the shock of seeing what appeared to be an outright usurpation of management duties was strong, it should have been realized that it is impossible for mortals, at least, to forecast for 1945 and 1946 the size and location of units the load for which has not yet been conceived.

This is recognized in the new OPM power unit, which has started to evaluate future power requirements regionally. Even FPC, which is cooperating with OPM, is cognizant of this situation for it has announced its intention of discussing these future requirements with each of the companies involved.

Some dismay was expressed at the list of projected government-owned hydro projects as well as their geographic diversity. This is the list of projects sponsored by the public power bloc. Projects already in operation or under way can be expected to expand, but we would expect that under the present set-up new projects will have to prove themselves as defense necessities before they can get OPM approval. St. Lawrence received OPM's blessing before this new power unit was formed.

The regional set-up for power pools through extended and strengthened interconnection is a logical one. It will give OPM more latitude in placement of defense load and should greatly minimize the possibility of having to ration power should difficulty arise in any locality.

The present assumption by OPM of responsibility for power, if not sabotaged by politics, should insure the adequacy of defense power supply with the minimum of dislocation, for the policy of the power unit is one which should command the greatest cooperation on the part of power men.

Responsibility for Fluorescent Promotion

IT IS ONE THING to accept readily reductions in kilowatt-hour consumptions through extended daylight saving and lowered appliance outputs as defense enforcements, but it is something else to permit the shortsighted fluorescent selling practices of others to reduce still further the revenue from lighting.

Recent studies in widely separated sections of the country indicate a load reduction from replacements by fluorescent of varying amounts up to nearly 50 percent and an energy consumption reduction of a somewhat lesser figure. Extension of burning hours has been responsible for the smaller reduction in usage.

Analysis of these figures shows that the customer on the whole got more light, but not enough to warrant the change. All that he saved was the reduction in energy usage.

The contractors, fixture dealers and wholesalers' salesmen are interested primarily not in improved lighting but in equipment sales. The utilities, on the other hand, make no money in fixtures; their revenue comes entirely from increased kilowatt-hour consumption. And this higher use can come either from longer burning hours or greatly increased lighting levels, or both.

If this were a problem in plane geometry the Q.E.D. would be obvious—the utilities for their own good must be more aggressive in selling greatly higher replacement foot-candles and in educating the legitimate trade to do likewise.

Thirty years ago, when tungsten seemed to threaten the lighting revenue, there were no "gadgets" that the salesman could use to demonstrate the advantages of higher illumination levels. In the last eight years four meter gadgets have been introduced to give to the custo-

mer some tangible evidence of improved lighting: First, the foot-candle meter, then the visibility meter, brightness meter and now the foot-candle selectometer.

With these instruments the salesman can not only show the customer the quantity and quality of present lighting but he can now go a step farther—he can let the customer select the level of illumination he would like to have. That is the function of the foot-candle selectometer. Curiously enough, the customer always selects a level far above any recommended practice.

But these tools cannot do the job alone. There must also be promotion and selling. The latter is a matter of trained personnel, but the former must get its beginning in an all-out policy. Nothing is to be gained from a policy of "faint praise," but load mortality.

In this issue, which contains our annual lighting insert, we are presenting the fluorescent lighting promotion practices of nearly sixty operating companies in the hope that in the seventeen different elements presented we may be of some assistance to companies now formulating programs for the fall lighting season.

Let there be no misunderstanding that as time goes on there will be less and less new load, other than defense needs, for utilities to sell. Fluorescent lighting, with its inherent sales appeal, offers an opportunity.

Let's Put the Spotlight on Our "J.B.s"

AT THE E.E.I. convention in June the Matthews award for valor went to J. B. Handley, Texas lineman. "J.B." didn't get to go to Buffalo to receive his award publicly from the hands of the donor as did the other prize winners. He received his award by mail, and in his reply said: "I appreciate it far more than I can say here, because it has brought to the attention here in our property the actual value of a type of workman who in a large sense heretofore has been overlooked."

We are afraid "J.B." is right. We have become so accustomed to having our linemen do, day or night, what to others would appear to be impossible that we take it for granted. He also was right when he said that he did nothing that linemen aren't doing daily all over the country. There is a difference, however. The industry heard about "J.B.'s" grand perserverance; it doesn't hear about the feats of others.

Now the telephone people are just as proud of their record of service continuity as are the electric fellows, but you don't see them keeping quiet when one of the people puts his or her job ahead of personal safety or comfort. And what is the result? A high public regard for the qualities of all telephone people.

We don't know J. B. Handley, never had the pleasure of meeting him, but to us "J.B." typifies a kind of public utility employee who has done as much as the engineers to give fact to service continuity. Let's not take them for granted any longer. We know they're good, let's be sure that the public has an equal appreciation.

The better the public thinks they are, the better the public will think the utility is.

Oh! War, Where Is Thy Profit?

WHAT is probably the most illuminating proof of profitless war prosperity is contained in the General Electric statement for the first six months of this year. Sales billed exceeded the same period of last year by $108,712,953, or 57 percent; net profits exceeded that period by $22,093, or 0.085 percent.

Who said that business wanted war?

Capacitors for Transmission

NOT SO FAR BACK the power limits of transmission systems were largely fixed by stability limitations. But engineering progress toward faster relaying and interruption, reclosure, surge deflection and better system operating procedures have very largely removed the stability limitations. That all means that many lines can now be assigned load limits that approach the thermal limits of the conductors, provided the terminal equipment is equally capable and voltage regulation is well in hand.

However, it is necessary to leave a fair margin for short-circuit duty over and above the normal and emergency loadings of the line. This margin, as well as the sustained values, will have to be computed for each line in the light of local factors.

All this suggests that maximum kilowatts over the line can be achieved only if the reactive kva. are kept to a minimum for the line taken as a whole. That is a familiar and rudimentary principle of circuits. The added thought to recognize is that maximum kilowatts per conductor ampere will require unity power factor at some intermediate point, and this condition is obtainable if reactive kva. are supplied at both ends of the section.

Just how to accomplish this—whether by synchronous condensers, shunt capacitors, series capacitors or by a combination of them—depends on analysis of the characteristics of the line and the desired load increment, as well as the available reactive capacity at the sending end.

For the present the prompter shipments possible on capacitors as against the likely delays for rotating corrective equipment should command attention as a way of squeezing more load onto lines. Some of the skepticism about series capacitors could well fade away during this effort to meet emergency load. They are no longer an academic theory. Experience with them has shown how to circumvent obscure difficulties. Anyhow, capacitors are inherently unit assemblies that can be converted from series to shunt service or vice versa, they have high salvage values and they can be split in any needed aggregations very readily, when the emergency passes.

'Quoddy May Yet Be Drafted

By CARTER FIELD

This noted journalist gives his personal comments and interpretations on current happenings affecting the electrical industry. His background and his location at Washington make his thoughts informative and interesting even though all may not agree with him

POWER at the mine mouth, thus saving the expense of hauling the coal to the power plant, is proposed in an Illinois development, now seeking federal aid, by the simple expedient of bringing the water to the mine mouth instead of taking the coal to water.

Another paradox involved is that it is planned to construct a hydro plant in order to make a coal plant possible, instead of constructing a steam plant to make a hydro plant practical.

The whole idea is to impound enough water behind dams to provide the enormous amount of water necessary for condensing purposes. And these dams will provide "incidental" hydro power, if the New Deal and certain former Supreme Court Justices will forgive the use of this word.

Some years back the writer was playing golf at Miami Beach one January with a director of important New York utilities. The conversation turned to the weather, which had driven him South.

Never Freezes

"The old timers say this is nothing to the winters when they were boys," he said, "and they prove it. When they were young the East River frequently froze over. Now it never does.

"What they don't know," he added whimsically, "is that it can't freeze now because we heat it."

"What do you mean—heat it?" I demanded.

"One of my companies has a conduit sucking water out of the East River into our plant," he said, "so big that you could drive a Ford through it. We have another which returns the water to the river. But when it goes back, in winter time, it's temperature is 15 degrees higher. Several other plants are 'heating' the river similarly. Of course it doesn't freeze.

"We need that cold water for cooling, despite the fact that our chief expense is to produce heat to make steam, most of it to make electricity.

"That is why so far we do not have big electric plants at the mouths of coal mines. It just so happens that there is not sufficient water for cooling near the mouths of most mines. Some day we are going to find out how to produce power from coal without this terrific waste in the now necessary cooling process. Inventors may even utilize the power now wasted by cooling internal combustion engines. But at present it needs almost as much water for a steam as for a hydro plant."

The government has been inching into the business of producing electricity from steam for the obvious reason that in order to provide firm power against occasional droughts it is necessary to have this standby power. This was the necessary rung on the ladder after the Supreme Court ruled that "incidental" power produced as a result of dams for flood control and navigation was constitutionally legitimate.

But this Illinois proposal must have impounded water to make its steam plants possible.

As this is written there is no certainty that the proposal will win Congressional sanction, but the betting odds favor it, the logic being the same as caused the rebuff to Harold Ickes on the recent licenses to two privately owned hydro sites in California. The logic is very simple. It is merely that OPM and the Federal Power Commission see eye to eye on one point—that national defense is going to need every possible kilowatt that can be produced, no matter where, and, almost, no matter what the cost. One might even add, no matter what the length of time of construction necessary.

It is this logic which gives the St. Lawrence seaway a fair chance of passage, even if the Canadian government continues to back away from any semblance of a guarantee as to when it will complete its part of the work. The Canadian government apparently wants to conserve its efforts for what it regards as real war work during the emergency, which would seem to be a fair tip to any gambler not to bet that ships would be using the new seaway while Canada is still at war.

But the President did not pull William S. Knudsen and OPM in line by his arguments about the use of the seaway by ships—the argument was that the power would be needed by national defense industries in the long war every one of the Administration moves is contemplating.

'Quoddy in Uniform

Don't even be too sure that Passamoquoddy is definitely through as a possibility. In a new report just on the desk of everybody interested it is pointed out coldly that this big tidal project is not economically sound at present. But the flat statement is made that it will be in the future.

Then, remembering FDR's passion for that particular project—that he spent millions of government money getting it started before asking Congress, and that he won the Supreme Court battle after what looked for a while like a Waterloo, don't be surprised if old 'Quoddy is dandied up in a national defense uniform and presented at the Capitol again!

In fact, if the Florida Ship Canal had a real power angle, instead of being a ditch through flat country, that recent power shortage scare in the Southeast would have seen it marching through Congress with no more effective opposition than that which the lease-lend opponents mustered.

The same report on 'Quoddy which the Administration is now studying, by the way, makes much of the fact that its power would not be affected by droughts!

NEWS OF THE WEEK

OPM Creates New Agency to Handle Power Program

J. A. Krug to head new unit to assume responsibility for defense power planning — Sets up two new power pools to insure electric energy for defense purposes — Acts as clearing house

The Office of Production Management acted this week to assume full responsibility for defense power planning and to vest final authority on all power matters in a specially created unit headed by J. A. Krug.

The new unit has a close working arrangement with the Federal Power Commission, and a consulting board made up of leading figures from both the public and private operating fields is being created.

OPM-FPC Partnership

OPM's action appeared likely to head off a strong bid by Secretary Ickes to run the power show himself. Whether the coup succeeds finally, however, now depends upon what action President Roosevelt takes on Mr. Ickes' proposal that he be delegated to plan future power generating expansion.

FPC's ambitious five-year plan for government ordering and allocation of capacity generator production, released for the purpose of exhibiting a definite program of action while Secretary Ickes was at the White House discussing the need for such a step, fits into the OPM-FPC partnership, but it will undergo extensive modifications in practice.

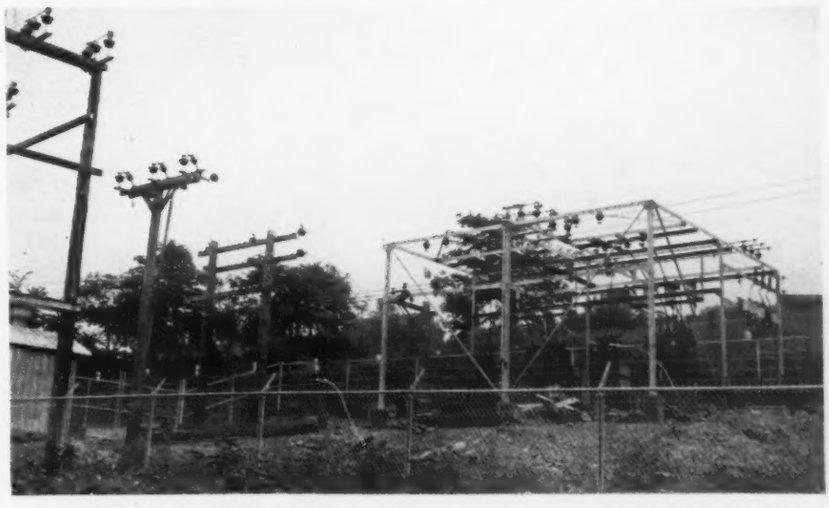
Purpose of the new OPM unit is to provide a single clearing house for all defense power problems—this is the formal definition given by Director Knudsen and Associate Director Hillman in a joint announcement of the setup. (ELECTRICAL WORLD, July 5, page 7.) Mr. Krug's flexible consulting staff will include not only representatives of government power agencies (TVA, Bonneville, Reclamation, REA) but also such private industry men as Philip Sporn of American Gas & Electric, J. Moore of Electric Bond & Share, E. W. Morehouse of the Associated Gas & Electric trustees and K. M. Irwin and Constantine Bary of Philadelphia Electric.

John C. Parker, vice-president of Consolidated Edison Co., and Fred Schaff, Superheater Co., will be on the Krug staff to handle priorities. All priority matters, both of raw materials for operations and allocation of generator capacity to meet defense requirements, will clear through this unit. Three members of the FPC staff also have been assigned to Mr. Krug to correlate the activities of the two agencies and prevent duplication of effort. They are George H. Buck of FPC's defense engineering staff, Walter E. Caine, rate expert, and William S. Youngman, FPC general counsel. Mr. Youngman will act as liaison; the others will work full time with OPM.

Definite OPM Data

Mr. Krug is presently re-estimating on the basis of definite OPM data for defense plant expansion the electric power requirements for defense area by area throughout the country, as well as the capacity of manufacturers to produce additional generating equipment. This information will be dovetailed into the FPC efforts along these same lines to correlate the two programs and re-set the "sights."

It is into this readjusted objective that FPC's program for insuring capacity output of generator equipment fits. This plan was released at a time



FULLY AUTOMATIC—Included in the improvement which West Penn Power Co. is making is the non-attendant, fully automatic distribution substation at Clifton, which is well under way. New transmission extensions are under construction

APPENDIX A—Preliminary Program of New Generating Facilities to Meet Anticipated Loads Through 1946, as Promulgated by the Federal Power Commission

($36,000,000,000 Annual Defense Expenditure)

Steam-Electric Projects

Region	System	Plant and Location	Capacity to Be Installed, Kw.	Year to Be Completed
I	Central Maine Power Co.	Wiscasset, Wiscasset, Maine	40,000	1945
	Boston Edison Co.	Mystic, Boston, Mass.	80,000	1943
			80,000	1944
			80,000	1945
		Edgar, Boston, Mass.	80,000	1945
	Narragansett Elec. Co.	Manchester Street, Providence, R. I.	40,000	1945
	United Illuminating Co.	English, New Haven, Conn.	80,000	1944
	Hartford Elec. Co.	S. Meadow, Hartford, Conn.	80,000	1946
	Connecticut Light & Power Co.	Montville, Montville, Conn.	40,000	1945
	Connecticut Power Co.	Stamford, Stamford, Conn.	80,000	1944
	New Hampshire Gas & Elec. Co.	Portsmouth, Portsmouth, N. H.	40,000	1944
	Long Island Lighting Co.	Glenwood, Glenwood, N. Y.	80,000	1946
	Niagara Hudson Co.	Oswego, Oswego, N. Y.	80,000	1944
			80,000	1946
		Dunkirk (New Plant), Dunkirk, N. Y.	80,000	1943
			80,000	1944
			80,000	1946
		Huntley, Buffalo, N. Y.	80,000	1946
	Central Hudson Gas & Elec. Co.	Poughkeepsie, N. Y.	40,000	1945
			80,000	1946
	New York State Elec. & Gas Co.	Binghamton, Binghamton, N. Y.	40,000	1946
		Elmira, Elmira, N. Y.	40,000	1946
		Greenidge, Dresden, N. Y.	40,000	1945
	New York Power & Light Co.	Schenectady, Schenectady, N. Y.	80,000	1946
	Public Service Elec. & Gas Co. of N. J.	Burlington, Burlington, N. J.	100,000	1944
	Pennsylvania Power & Light Co.	Stanton, Harding, Pa.	80,000	1945
		Sunbury (New Plant), Sunbury, Pa.	80,000	1944
			80,000	1945
	Metropolitan Edison Co.	Middletown, Middletown, Pa.	80,000	1946
	New Jersey Power & Light Co.	Gilbert, Holland, N. J.	80,000	1946
	Consolidated Gas, Electric Light & Power Co. of Baltimore	Riverside, Baltimore, Md.	80,000	1944
			80,000	1945
	Potomac Electric Co.	Blue Plains (New Plant) Washington, D. C.	80,000	1943
			80,000	1945
			80,000	1946
II	American WaterWorks Co.	Millville (New Plant) Millville, W. Va.	40,000	1944
		Parkersburg, Parkersburg, W. Va.	60,000	1944
		Springdale, Springdale, Pa.	60,000	1943
			60,000	1945
	Pennsylvania Electric Co. & Associates	Raystown (New Plant) Raystown, Pa.	40,000	1944
	Duquesne Light Company	Philips, Ambridge, Pa.	60,000	1943
			60,000	1944
	Cleveland Electric, Ill. Co.	Avon, Cleveland, Ohio	100,000	1945
		Lake Shore, Cleveland, Ohio	60,000	1943
			60,000	1944
			60,000	1946
	City of Cleveland	Lake Road, Cleveland, Ohio	25,000	1944
	Cities Service Power and Light Co.	Acme, Toledo, Ohio	50,000	1944
		Water St., Toledo, Ohio	50,000	1945
		Edgewater, Lorain, Ohio	20,000	1944
			50,000	1946
	American Gas & Electric Co.	Glen Lynn, Glen Lynn W. Va.	85,000	1943
			85,000	1945
		Philo, Philo, Ohio	85,000	1944
		Parkersburg, Parkersburg, W. Va.	120,000	1945
	Public Service Co. of Indiana	Dresser, Dresser, Ind.	60,000	1943
	Southern Indiana Gas & Electric Co.	Ohio River, Evansville, Indiana	40,000	1946
	Louisville Gas & Elec. Co.	Watersido, Louisville, Ky.	60,000	1946
	Kentucky Utilities Co.	Tyrone, Tyrone, Ky.	25,000	1946
	Consumers Power Co.	Morrow, Kalamazoo, Mich.	50,000	1945
			50,000	1944
		Weadock, Bay City, Mich.	50,000	1945
	Detroit Edison Co.	Trenton Channel, Detroit, Mich.	75,000	1944
			75,000	1946
		Marysville, Marysville, Mich.	75,000	1945
		Conners Creek, Detroit, Mich.	75,000	1944
			75,000	1946
	Columbus & S. Ohio Elec. Co.	Picway, Columbus, Ohio	60,000	1944
	Cincinnati Gas & Elec. Co.	Columbia, Cincinnati, Ohio	120,000	1944
			60,000	1945
			60,000	1946
	Indianapolis Power & Light Company	Harding Street, Indianapolis, Ind.	60,000	1946
III	Va. Elec. & Power Co.	Petersburg (New) Petersburg, Va.	40,000	1943
			40,000	1946
	Va. Public Service Co.	Bremo Bluff, Bremo Bluff, Va.	40,000	1943
			40,000	1945
	Duke Power Co.	Tiger, Duncan, S. C.	40,000	1943
		Riverbend, Mt. Holly, N. C.	40,000	1943
		Cliffside, Cliffside, N. C.	40,000	1943
		Buck, Spencer, N. C.	80,000	1945
	Carolina Power & Light Co.	Cape Fear, Moncure, N. C.	25,000	1943
			25,000	1944
		Raleigh (New), Raleigh, N. C.	50,000	1946
	South Carolina Elec. & Gas Co.	Parr Shoals, Parr, S. C.	60,000	1943
			60,000	1945
	Alabama Power Co.	Gorgas No. 2, Gorgas, Ala.	60,000	1943
			60,000	1945
		Chickasaw, Mobile, Ala.	40,000	1945
			40,000	1946
		Montgomery (New) Montgomery, Ala.	40,000	1946
	Georgia Power Co.	Arkwright, Macon, Ga.	40,000	1943
			40,000	1945
		Columbus, (New) Columbus, Ga.	60,000	1944
	South Carolina Power	Charleston, (New) Charleston, S. C.	25,000	1945
	Savannah Elec. & Power Co.	Riverside, Savannah, Ga.	25,000	1944
	Florida Power Corp.	River Junction (New), River Junction, Fla.	40,000	1945
	Florida Power & Light Co.	Lauderdale, Dania, Fla.	25,000	1946
IV	Wisconsin-Michigan Power Co.	Green Bay, Green Bay, Wis.	50,000	1945
	Wisconsin Electric Power Co.	Port Washington, Port Washington, Wis.	80,000	1944
			80,000	1946
		Commerce Street, Milwaukee, Wis.	50,000	1944
			50,000	1946
	Commonwealth Edison Co.	Powerton, Powerton, Ill.	150,000	1944
		Northwest, Chicago, Ill.	80,000	1945
		Stateline, Chicago, Ill.	150,000	1944
		Crawford, Chicago, Ill.	80,000	1945
			80,000	1946
	Northern Indiana Public Service Co.	East Chicago, East Chicago, Ind.	60,000	1943
		Michigan City, Michigan City, Ind.	80,000	1945
			80,000	1946
	Moline-Rock Island Mfg. Co.	Riverside, Iowana, Iowa	50,000	1944
		Moline, Moline, Ill.	50,000	1945
			50,000	1946
	Union Electric Co. of Mo.	Ashley Street, St. Louis, Mo.	80,000	1945
			80,000	1946
		Venice, Venice, Ill.	80,000	1944
	Northern States Power Co.	High Bridge, St. Paul, Minn.	50,000	1944
	Minnesota Power & Light Co.	Duluth, Duluth, Minn.	40,000	1944
			40,000	1946
	Des Moines Electric & Power Co	Des Moines, Des Moines, Iowa	35,000	1944
	Interstate Power Co.	Dubuque, Dubuque, Ia.	20,000	1945
	Iowa Elec. Light & Power Co.	Cedar Rapids, Cedar Rapids, Ia.	20,000	1945
	Kentucky Utilities Co.	Paducah, Paducah, Ky.	40,000	1944
			40,000	1945
	Central Illinois Public Service Co.	Grandtower, Grandtower, Ill.	40,000	1945
		Meredosia (New Station), Meredosia, Ill.	20,000	1946
V	U. S. Government	Camden (New), Camden, Arkansas	40,000	1943
			40,000	1943
			40,000	1943
	U. S. Government	Jonesboro Plant (New), Jonesboro, La.	30,000	1943
			30,000	1943
	Gulf States Utilities Co.	Louisiana Plant, Baton Rouge, La.	25,000	1945
	Texas-New Mexico Utilities Co.	Tuco Plant, Abernathy, Texas	20,000	1945
	Panhandle Power & Light Co.	Riverview Plant, Berger Texas	20,000	1945
	San Antonio Public Service Co.	Comal Plant, New Braunfels, Texas	30,000	1945
	Houston Power & Light Co.	Deepwater Plant, Houston, Texas	30,000	1946
	Southwestern Gas & Electric Co.	Arsenal Hill, Shreveport, La.	60,000	1946
VI	Otter Tail Power Company	Kidder Plant, Wahpeton, North Dakota	20,000	1945
	Northwestern Public Service Co.	Mitchell Plant, Mitchell, South Dakota	20,000	1946
	The Kansas Electric Power Co.	Hutchinson Plant, Hutchinson, Kansas	30,000	1946
	Empire District Electric Co.	Riverton Plant, Riverton, Kansas	25,000	1946
VII	Utah Power & Light Co.	Jordan Plant, Salt Lake City, Utah	25,000	1943
			25,000	1944
		Provo Station, Provo, Utah	50,000	1945
	The Colorado-Oregon Power Co.	Coos Bay Plant, North Bend, Oregon	30,000	1944
			30,000	1946
	Portland General Electric Company	"L" Station, Portland, Oregon	35,000	1945
			35,000	1945
	Puget Sound Power & Light Company	Shuffleton Plant, Renton, Washington	35,000	1945
			35,000	1945
	Seattle Municipality	Lake Union Plant, Seattle, Washington	25,000	1945
VIII	San Diego Gas & Electric Co.	Silver Gate, San Diego, Cal.	35,000	1944
			35,000	1944
	Central Valley Authority	Antioch (New), Antioch, Cal.	75,000	1945
	City of Los Angeles, Bureau of Power & Light	Harbor Plant, Los Angeles, Cal.	65,000	1945

Appendix B—Preliminary Program of New Generating Facilities to Meet Anticipated Loads Through 1946

($36,000,000,000 Annual Defense Expenditure)

Hydro-Electric Projects

Region	Drainage Basin	Project Name	State	Installed Capacity, Kw.	Year Completed
I	Merrimack River	Blackwater	N. H.	7,000[1]	1943
	Merrimack River	Lower Hillsboro	N. H.	12,000	1945
	Merrimack River	Bennington	N. H.	Storage	1943
	Merrimack River	Livermore Falls	N. H.	12,000	1944
	Merrimack River	Franklin Falls	N. H.	14,000[1]	1944
	Connecticut River	Knightsville	Mass.	5,000[1]	1943
	Connecticut River	Newfane	Vermont	40,000	1946
	Connecticut River	Upper 15 Mile Falls	N. H.	70,000	1946
	Connecticut River	Victory	Vermont	Storage	1944
	Connecticut River	Enfield	Conn.	30,000	1943
	St. Lawrence River	St. Lawrence	N. Y.	550,000	1944
				350,000	1945
	Black River	Panther Mountain	N. Y.	Storage	1943
	Susquehanna River	Safe Harbor	Penna.[1]	60,000[2]	1946
	Susquehanna River	Conowingo	Md.[1]	72,000[2]	1946
II	Clarion River	Mill Creek	Penna.	60,000	1946
	Clarion River	Foxburg	Penna.	50,000	1946
	Youghiogheny River	Confluence	Penna.	24,000[1]	1943
	Youghiogheny River	Crellin	Maryland	Storage	1943
	Youghiogheny River	Victoria A	Penna.	19,000	1943
	Youghiogheny River	Victoria B	Penna.	15,000	1943
	Youghiogheny River	Victoria C	Penna.	10,000	1943
	Youghiogheny River	Victoria D	Penna.	Storage	1943
	Youghiogheny River	Sang Run	Md.	30,000	1943
	Youghiogheny River	Swallow Falls	Md.	15,000	1943
	Cheat River	Rowlesburg (Cheat No. 12)	W. Va.	50,000	1945
	Cheat River	Cheat No. 14	W. Va.	40,000	1946
	Cheat River	Cheat No. 15	W. Va.	40,000	1946
	Cheat River	Cheat No. 18	W. Va.	40,000	1946
	Cheat River	Cheat No. 13B	W. Va.	60,000	1946
	New River	Bluestone	W. Va.	60,000	1943
	Juniata River	Raystown	Penna.	60,000	1946
III	Tennessee River	Hiawassee-Ocoee[3a]	N. C.	210,000	1943
	Tennessee River	Holston	Tenn.	135,000	1944
	Tennessee River	Fontana	N. C.	300,000	1945
	Cumberland	Wolf Creek[3b]	Ky.	125,000	1946
	Santee River	Blairs	S. C.	40,000	1946
	Santee River	Clinchfield	S. C.	Storage	1945
	Santee River	Frost Shoals	S. C.	20,000	1946
	Yadkin River	High Point[5]	N. C.	21,000	1944
	Savannah River	Clark Hill[3b]	S. C.	70,000	1944
				70,000	1946
	Coosa River	Allatoona	Ga.	33,000	1944
	Chattahoochee	Roswell	Ga.	25,000	1946
	Potomac River	Millville	W. Va.	50,000	1945
	Potomac River	Harpers Ferry	W. Va.	30,000	1946
IV	Michigamme River	Way Dam	Mi.	(Storage)[1]	1943
	Michigamme River	Peavy Falls	Wis.	15,000	1943
V	Arkansas River	Nimrod	Ark.	7,000[1]	1943
	Arkansas River	Markham Ferry	Ark.	30,000	1943
	Arkansas River	Fort Gibson	Ark.	30,000	1943
	Red River	Denison	Okla.-Tex.	70,000[1]	1944
	White River	Norfolk	Ark.	60,000[1]	1943
	White River	Bull Shoals	Ark.	110,000	1945
	White River	Table Rock	Mo.	60,000	1946
	Neches River	Rockland	Texas	9,000	1945
	Neches River	McGee Bend	Texas	15,000	1945
	Neches River	Dam A	Texas	5,000	1945
	Neches River	Dam B	Texas	5,000	1945
	Brazos River	Whitney	Texas	20,000	1944
	Guadalupe River	Canyon	Texas	10,000	1945
VI	Columbia River	Grand Coulee[1]	Washington	324,000	1943
				108,000	1944
				108,000	1945
				108,000	1946
	Puget Sound	Nisqually	Washington	90,000	1944
	Fayette River	Scriver Creek	Idaho	50,000	1946
	Flathead River	Hungry Horse	Mont.	172,000	1946
	Snake River	Anderson Ranch	Idaho	30,000	1946
VII	Sacramento River	Cresta	Cal.	68,000	1943
	Sacramento River	Pulga	Cal.	80,000	1943
	San Joaquin River	Red Mountain Bar	Cal.	15,000	1943
	Sacramento River	Shasta No. 5	Cal.	75,000[4]	1944
	Sacramento River	Keswick	Cal.	75,000	1944
	Colorado River	Boulder	Ariz.-Nev.	2-82,500[2]	1943
	Colorado River	Parker No. 4	Ariz.-Cal.	30,000[2]	1943
	Colorado River	Bulls Head[3a]	Ariz.-Nev.	90,000	1945
	San Joaquin River	Pine Flat	Cal.	15,000	1945

[1] Addition of generating units at project now under construction.
[2] Addition of generating units at existing project.
[3] Authorized in whole (3a) or in part (3b).
[4] Believed to be covered by general authorization.
[5] Proposed for early construction by City of High Point, North Carolina.

when something showing a concrete program was essential from an internal Washington political standpoint and Chairman Olds of FPC emphasizes that the allocation list and hydro projects outlined are a working basis, rather than a final objective.

Beginning at once, FPC plans conferences with individual utilities to work out modifications in the plan which may be desirable from an operations standpoint. Further revisions in the list will be dictated by OPM, through Mr. Krug and his staff, as the needs of the defense program unfold.

Utilities to Place Orders

Although the program outlines generator installations at the rate of 2,500,000 kw. of steam and 1,000,000 kw. of hydro annually through 1946, there is no intention by FPC or OPM to order the works now. Mr. Olds believes orders for 1943 and 1944 deliveries should be placed rather promptly—by utilities after consulting with defense officials if possible, or by the government through the proposed RFC subsidiary corporation if that is necessary. Mr. Krug is understood to believe a government corporation is not necessary, at least at this time, although some federal aid in financing expansion and extensions probably will be.

Most of the hydro installations proposed by FPC would be at existing federal projects or new ones to be built as multi-purpose developments. Most of the steam capacity would be for private utility central stations. FPC proposed, and Mr. Krug believes it inevitable that specifications for generators will have to be considerably standardized, both to save materials and time and to increase production efficiency. In some instances this may result in starting a new central station rather than add another generator to one with older equipment.

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Strike at Pittsburgh

Building trades workers tied up work on power projects in the Pittsburgh area when the Pittsburgh Building Trades Council (AFL) ordered its members to cease work at two Duquesne Light Co. plants being constructed at a cost of $11,000,000. The union accused the utility of "stalling" over union demands for a closed shop and asked the Labor Department to refer the dispute to the National Defense Mediation Board.

Four Utilities Plan New Station Units

Union Electric Co. has ordered another 80,000 kw. generator from General Electric Co. to be installed in a third section of the Venice No. 2 power plant which is now under construction at Venice, Illinois.

Public Service Co. of New Hampshire has ordered a 10,000 kw. General Electric turbine, a Westinghouse condenser and a Babcock & Wilcox 125,000 lbs. per hour integral furnace boiler for installation at its Manchester plant by July, 1942.

Minnesota Power & Light Co. is to install a new 33,500 hp. generating unit at the Duluth steam electric plant to be in service in 1943.

Pacific Gas & Electric Co. plans a new 9,000-kw. hydro plant on the Yuba River to cost $1,000,000.

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Power Curtailment

Despite recent heavy rains and some local showers, water levels in Southeastern rivers are decreasing rapidly and power curtailment again has been ordered back in practice.

NEWS BRIEFS

DISINTEGRATION of holding company systems are sure to be slowed up unless Congress does something about the tax situation. SEC realizes the situation and has asked the Treasury to do something about it. The hitch is the capital gains tax on sale of operating subsidiaries.

PURCHASE OF $160,000 of defense savings bonds has been made by employees of Public Service of New Jersey system up to July 1. Of the bonds subscribed for, 4,122 are of $25, 400 of $50, 283 of $100 and 3 of $1000 denomination.

CITIES AND TOWNS in the Southeast will get a government airplane named for it by saving electric power in the present conservation program. The planes to be so dedicated will be Vigilantes, new-type observation ships being built by the Vultee plant at Nashville.

MORE THAN 40 diplomatic representatives of the Republics of South and Central America went on a four-day trip to inspect American defense projects and activities in the Tennessee Valley, including TVA power projects, army camps, industrial plants, and munitions and airplane plants.

WHEN FALL BREEZES IN housewives will get new angles on electric cooking. A national drive sponsored among utilities and dealers by the manufacturers participating in the NEMA program will get under way by the Modern Kitchen Bureau's electric range campaign. Slogan is: "The Switch Is On—Cooking's Going Electric." So far 28,000 kits and plan books have been mailed out to electrical dealers and utilities.

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Utilities See Need Of Project Priority

Utility representatives met in Pittsburgh last week to discuss the difficulties encountered in seeking priorities to speed new construction and extension of service to meet the growing power needs resulting from the defense effort.

More than twenty-five representatives met at the discussion meeting, held under the auspices of the Edison Electric Institute. The meeting had been called because of the large number of inquiries to the E.E.I. from the utilities. It is likely that an industry committee will be organized to discuss the situation with the OPM and to promulgate such plans as are needed to speed defense work.

The group felt that a project priority would be desirable, since it would give all essential equipment for the project the same rating.

Difficulties encountered in the maintenance and repairs priority were discussed and it was brought out that there is need for clarification to allow for equipment of a higher rating, which might include some actual extensions to improve service, when used to replace present equipment. It was felt that such equipment should be given the maintenance and repair priority. The utility representatives felt that these routine improvements and extensions should get such a priority since they are on a basis to maintain efficient service as loads grow.

The fact that a new light, heat and power committee is to be formed in OPM opinion was expressed that such a committee would greatly relieve the strain in seeking priorities for utility equipment. Priority requests could be sent to this group and routed through proper channels to speed ratings.

It was pointed out that there should be no delay in placing orders for equipment and no delay in planning future projects. Opinion was that the utility which had placed its orders well in advance of delivery would be given first consideration.

E.E.I. was represented by President Charles W. Kellogg, Col. H. S. Bennion and Alexander Maxwell. Among the utility representatives were those from Consolidated Edison of New York, Public Service Co. of New Jersey, Philadelphia Electric, Consolidated Gas Electric Light & Power Co. of Baltimore, Duquesne Light, West Penn Power, Cleveland Electric Illuminating Co., Union Electric Co. of Mo., Cincinnati Gas & Electric, North American, Niagara Hudson Power, Commonwealth & Southern, Detroit Edison and Connecticut Light & Power Co.

READY FOR ADMITTANCE—Ipswich Municipal Light Department's latest Diesel unit, a Fairbanks Morse 1,050-hp. machine, stands protected against Bay State storms pending completion of foundation inside the station. Maxim silencers at right absorb sound of operating units

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Kentucky Utility to Tie Lines With TVA System

The Kentucky Public Service Commission has authorized the construction of a $1,000,000 power line between Hazard and Pineville which will be constructed by Kentucky and West Virginia Power Co. to connect power facilities with TVA in a move to relieve the power shortage of TVA.

TVA is starting construction of a line from Pineville to Norris Dam at a cost of about $1,000,000. When both lines are completed power from the Kentucky Utilities system as well as from Kentucky and West Virginia Power will be available to the TVA area.

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Offers to Buy Utility

The City Council of Cannelton, Ind., in a special session by resolution offered $125,000 for the physical properties of the Ohio River Power Co. in the city. The resolution was forwarded to Associated Gas & Electric and will be placed before the court handling the receivership of Ohio River Power Co.

OPM Creates Power Pools for Defense

Two more giant power pools to tap reserves of private and public utilities for aluminum production were announced in embryonic stage this week by J. A. Krug, OPM's coordinator for Defense Power. Mr. Krug stressed that both pools are being made possible largely through voluntary cooperation among the utilities involved.

One pool embraces New York, eastern Pennsylvania, New Jersey and New England to provide energy for plants which will turn out 150,000,000 pounds of aluminum annually in upper New York state. In the Southwest a new network of transmission lines will pool power from Arkansas, Oklahoma, Texas, Louisiana, Missouri and Kansas for production of 100,000,000 pounds of aluminum in Arkansas and additional magnesium capacity in Texas. Necessary interconnections for these pools will be built under Section 202 of the Federal Power act.

Mr. Krug also announced as an example of industry cooperation with defense the agreement to construct immediately a 154-kv. transmission line connecting the American Gas & Electric system at Hazard, Ky., with TVA at Norris Dam. This line, being built as a permanent interconnection, does not have the temporary exemption from jurisdiction afforded by Section 202. The $6,000,000 cost is being shared 50-50 by the private system and TVA.

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Completes Organization of Illinois Board

Governor Dwight H. Green has recently completed the organization of the Illinois Commerce Commission by the appointment of four members and the secretary.

The new members are: William Parrillo, Chicago attorney; Frank Peska, also Chicago attorney; Edwin A. Rosenstone of Cambridge, county clerk of Henry County and V. J. Washington, publisher, of Chicago. Frank M. Kalteux of Chicago was named secretary of the board, succeeding J. E. Knight of Dow, resigned.

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Will Transfer Line

The Public Service Commission has granted a petition of Niagara, Lockport & Ontario Power Co. for consent to transfer to the New York State Electric & Gas Corp. a single-circuit transmission line between its Throop Junction switching structure and the Weedport substation of New York State Electric & Gas and another single-circuit transmission line between Throop Junction station and the north boundary of the city of Auburn, for a nominal consideration of $1. Book cost of the property is $55,240 and original cost $47,836.

NEW OFFICES of Line Material Co. in Milwaukee, Wis., are lighted to 40 ft.-candle levels with 109 Hygrade-Sylvania fixtures, equipped with plastic diffusers and louvered bottoms and each housing four 40-watt fluorescent lamps. Mounting height is 10 ft. with 8 ft. to 8 ft. 6 in. light centers. The units provide 1.7 watts per sq.ft. of the 13,000 sq.ft. area. Light is concentrated on work areas, with aisles, etc., lighted by "spill" light from the work areas. Above photo shows partial view of one floor of new office building

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Form Virginia Super Coop

Five Eastern Virginia rural electric co-operatives have formed a "super" co-operative to generate and transmit power to their 5,000 miles of lines serving approximately 18,000 farm homes and a number of industries. The co-operatives have created the Eastern Generating Electric Co-operative, with Frank White of the Southside Electric Co-operative at Blackstone as president. The government would provide $1,500,000 of funds for the self-liquidating project.

•

Utility Coal Stocks

Total stock of coal on hand at electric utility power plants on June 1, was 10,169,314 tons, according to report of the Federal Power Commission. This was a decrease of 0.3 percent from May 1, and 6.1 percent under a year ago. Of the total stock, 8,991,150 tons were bituminous and 1,178,164 tons were anthracite. Electric utility plants consumed approximately 5,146,452 tons of coal in May, 4,888,226 tons of bituminous and 258,266 tons of anthracite, increases of 17.4 percent and 29.7 percent respectively as compared with April.

New Mexico PSC Will Administer Utility Act

As members of the New Mexico Public Service Commission to administer the new Utilities Control Act passed by the last Legislature, Governor John E. Miles has named Gail S. Carter, A. M. Fernandez and E. L. Manson. A salaried consumers' counsel remains to be appointed.

The new law, first utilities regulatory act ever passed in this state, empowers the commission to make surveys of public utilities, upon their own initiation or as a result of complaints by consumers, of public utilities in order to establish reasonable rates. Except by local option, municipally owned utilities are exempt from regulation under the law.

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PUD to Make Survey

Skagit County Public Utility District at Mount Vernon, Wash., has employed engineers to make a survey of Puget Sound Power & Light properties in Skagit County as a preliminary step toward instituting condemnation proceedings.

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Rebuild Old Station

The old electric generating plant at Clarendon, Ark., which was acquired by Arkansas Power & Light Co. several years ago, is to be rebuilt and is to be used as a reserve unit in case of interruption in the circuit between Clarendon and Pine Bluff.

Board Denies Petition for Rate Conformity

Illinois Commerce Commission has dismissed the petition of the village of East Alton, which in effect asked that rates of the Illinois Iowa Power Co. for electric service in the village be made to conform with those of the Union Electric Co. of Illinois, which serves only a small portion of the village.

Evidence presented, the commission ruled, does not show that the Illinois Iowa Power Co.'s rates are unjust or unreasonable. Rates of the two companies, the commission said, are difficult of comparison because the blocks in the rates are different.

A situation where two utility companies serve the same municipality results in "clearly an undesirable situation," the commission said, adding, however, that it is not questioned in the record in the case involved that both companies are lawfully rendering service in East Alton.

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Gas Company Withdraws Increased Schedules

Federal Power Commission has announced that the Memphis Natural Gas Co. has been permitted to withdraw its schedules providing for increased rates for natural gas sold to the Mississippi Power & Light Co. and to the Arkansas Power & Light Co. The schedules were suspended by order of the commission.

Public hearing previously set for July 1 in Washington has been canceled and the commission's order states that schedules heretofore applicable to the two purchasing companies shall remain in full force and effect until such time as they may be changed in a manner provided by the Natural Gas Act.

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Portland Utility Seeks to Buy New Facilities

Portland General Electric Co., Portland, Ore., has applied to the Federal Power Commission for authority to purchase the Butte Light & Power Co. of Scotts Mills, Ore., for a cash consideration of $20,000, subject to certain adjustments. The application states that the proposed merger has been approved by the Commissioner of Public Utilities of Oregon in accordance with the terms of a sale and purchase agreement dated May 15, 1941.

Butte Light & Power Co. owns and operates an electrical generating and distribution system in Marion and Clackamas counties, Oregon, in and around the community of Scotts Mills. The generating system consists of a 115-kva. hydro-electric generating plant. The distribution system serves approximately 200 customers. Approximately 85 per cent of the electric energy which it distributes is purchased at wholesale from Portland General Electric Co., the remainder being generated by its hydro plant.

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Philadelphia Electric to Change Depreciation Plan

Revisions in depreciation practices were agreed to last week by the Philadelphia Electric Co. following conferences with the public utilities division of the Securities and Exchange Commission.

While the agreement is tentative, pending final determination by the company of its property costs and the conclusion of studies on the present ages and probably useful earning lives of its utility assets, it provides that the company will substantially increase its annual depreciation accruals to not less than $7,000,000. It further provides that the utility will restrict $10,000,000 of its earned surplus existing at December 31, 1940, against dividend payments.

MEETINGS

International Association of Electrical Inspectors—Southwestern section, Hotel DeAnza, San Jose, Calif., August 25-27. H. L. Gerber, secretary, Room 205, City Hall, San Francisco, Calif., northwestern section, Winthrop Hotel, Tacoma, Wash., September 2-5. F. D. Weber, secretary, P. O. Box 70, Portland, Ore.; western section, Hotel St. Paul, St. Paul, Minn., September 8-10. F. H. Moore, secretary, 320 N. Meridian St., Indianapolis, Ind.; eastern section, Mayflower Hotel, Washington, D. C., September 22-24. F. N. M. Squires, secretary, 85 John St., New York, N. Y.; southern section, McAllister Hotel, Miami, Fla., September 29-October 1. Joseph Whitner, secretary, P. O. Box 1743, Atlanta, Ga.

American Institute of Electrical Engineers—Pacific Coast convention, Yellowstone National Park, August 27-29. H. H. Henline, national secretary, 29 West 39th St., New York, N. Y.

Pennsylvania Electric Association—Annual convention, Bedford Springs Hotel, Bedford Springs Pa., September 3-5. A. B. Millar, managing director, State Street Bldg., Harrisburg, Pa.

Maryland Utilities Association — Annual convention, Ocean City, Md., September 5-6 (tentative). W. Cook, secretary, Potomac Edison Co. Bldg., Frederick, Md.

Rocky Mountain Electrical League—Annual convention, Stanley Hotel, Estes Park, Colorado, September 11-13. George E. Lewis, manager Gas and Electric Bldg., Denver, Colo.

Wisconsin Utilities Association—Accounting section, electric, gas and transportation, Lawsonia Hotel, Green Lake, Wis., September 12-13; electric section Hotel Schroeder, Milwaukee, October 13-14. A. F. Herwig, executive secretary, Room 502, Brumder Bldg., 135 West Wells St., Milwaukee, Wis.

Illuminating Engineering Society — Annual convention, Atlanta-Biltmore Hotel, Atlanta, Ga., September 22-25. Frank G. Horton, executive secretary, 51 Madison Av., New York, N. Y.

Association of Iron and Steel Engineers—Annual convention, Cleveland Public Auditorium, Cleveland, Ohio. September 23-26. Brent Wiley, managing director, Empire Bldg., Pittsburgh, Pa.

Indiana Electric Association—Annual fall meeting, French Lick Springs Hotel, French Lick, Ind., September 24-26. R. E. Blossom, secretary, 1414 Circle Tower, Indianapolis, Ind.

REA Lines Serve 5,365 Power Loads over 5 Kva.

Loads supplied by Rural Electrification Administration lines and requiring a service transformer capacity of 5 kva. or more numbered 5,365 on January 1, 1941, as compared with 3,507 a year previously, according to Administrator Harry Slattery.

Since January 1, he added, industrial load applications each month have showed an increase over the month before in required total connected load, increasing from 1,654 kw. in January to 3,033 kw. in June. The total anticipated connected load on REA systems from 188 new applications for industrial service from January 1 to June 30 was 14,543 kw. On April 30, 1941, the 718 energized REA systems had 291,986 miles of line in service.

Of the 136 different types of industries served, 37 types of "Food Processing" and "Farm Industries" represented 57 percent of the number of services and 47 percent of the connected transformer capacity.

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Maryland Communities Dark in Power Failure

The Vienna plant of the Eastern Shores Public Service Co. suddenly went out of operation at 2 p.m. July 16, cutting off electric power from most towns on the Maryland peninsula.

Frederick W. C. Webb, vice-president, said that the trouble was in the 44,000-volt control circuit. All available repair crews were sent from Salisbury to Vienna and attempts were made to put auxiliary plants into service.

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Grants Wage Increase

Wage increases ranging from seven and a half to ten cents an hour for the more than 650 employees of Indiana Service Corp. in Fort Wayne and Northeastern Indiana have been announced by W. Marshall Dale, president. The increase has been awarded to the entire organization.

•

Plans Plant Expansion

Public Service Electric & Gas Co., Newark, N. J., has approved plans for expansion in branch office and operating building at 162 Smith Street, Perth Amboy, N. J., including a one-story top addition to present two-story structure and new three-story rear extension. Cost estimated at about $80,000. Work will be placed under way at once.

Power Production Continues Upward

Power production for the week ended July 19 continued the upward movement to a new high and remains well above the peak of last winter. Output for the week was 3,162,586,000 kw.-hr., a gain of 18 percent over the same week last year, according to report of the Edison Electric Institute. Production was 0.68 percent above the preceding week and approximately 33 percent above the 1939 week.

The rains of a few weeks ago in the Southeast were not sufficient to maintain the flow of rivers and power rationing is going back into effect. Caution is being urged in the use of electricity as defense loads increase.

Gains over last year were extended in the Pacific Coast, Rocky Mountain and New England regions.

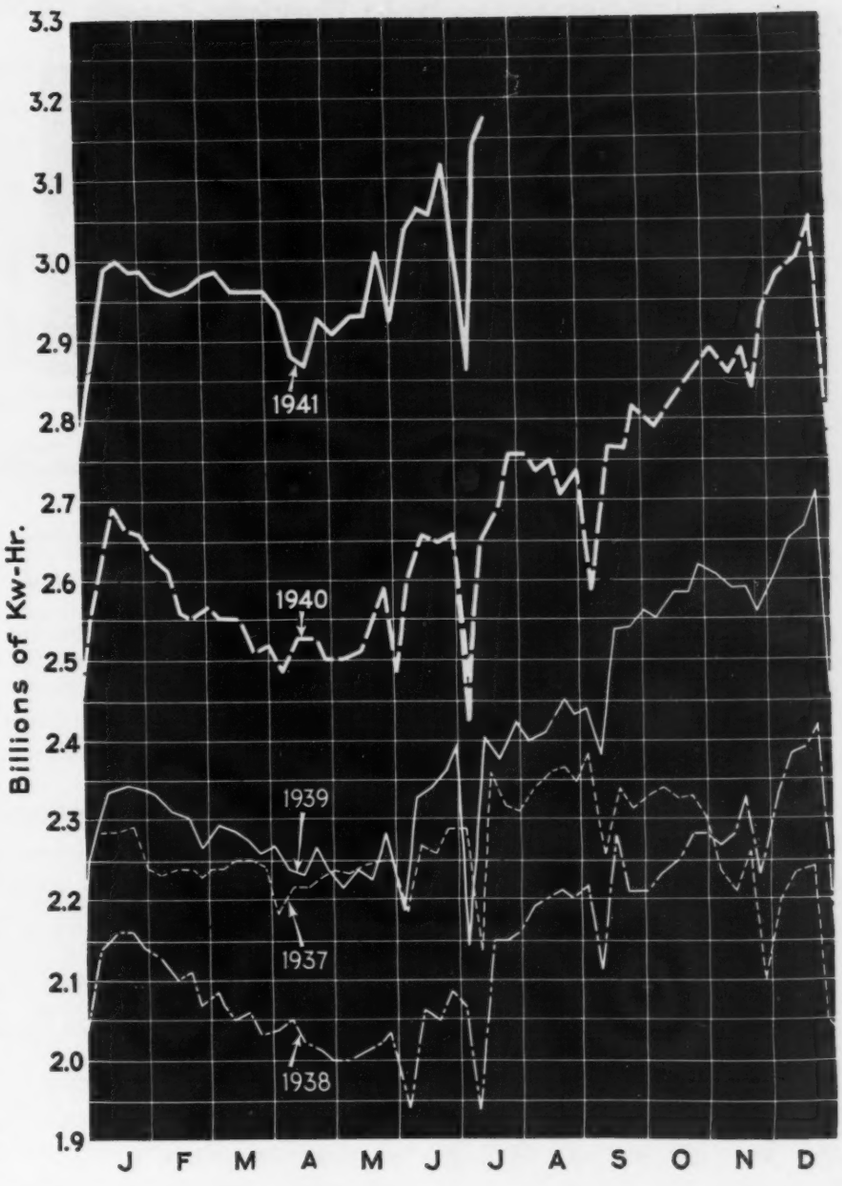
Weekly Output, Millions Kw.-Hr.

1941		1940		1939	
July 19	3,162	July 20	2,681	July 22	2,378
July 12	3,141	July 13	2,651	July 15	2,403
July 5	2,867*	July 6	2,425	July 8	2,145
June 28	3,121	June 29	2,660	July 1	2,396
June 21	3,056	June 22	2,654	June 24	2,362
June 14	3,066*	June 15	2,665	June 17	2,340
June 7	3,042	June 8	2,599	June 10	2,329
May 31	2,924*	June 1	2,478	June 3	2,186
May 24	3,012	May 25	2,589	May 27	2,278
May 17	2,983	May 18	2,550	May 20	2,235
May 10	2,975	May 11	2,516	May 13	2,239

Per Cent Change from Previous Week

	Week Ending		
	July 19	July 12	July 5
New England	+21.6	+20.1	+27.6
Mid-Atlantic	+17.2	+17.6	+21.2
Central Industrial	+22.8	+25.0	+25.6
West Central	+11.5	+17.4	+19.4
Southern States	+19.7	+21.0	+15.6
Rocky Mountain	+11.3	+ 4.1	+ 2.6
Pacific Coast	+ 9.1	+ 6.3	+ 4.1
Total United States	+18.0	+18.5	+18.2*

*Revised



FPC Reports 2% Increase in Water Power Capacity

Water power plants in the United States had a total installed capacity of 18,868,027 hp. on January 1, 1941, a net increase of 367,773 hp. over the previous year, according to the Federal Power Commission. This increase compared with an average annual increase for the 15-year period, 1926 to 1941, of 513,000 hp.

During 1940, seven major hydro-electric generating installations were placed in operation. Five of these, with a total capacity of 316,500 hp. were Federal projects, while two, of 76,500 hp., were installations by private companies. Ten states accounted for 59.2 percent of the total water-power capacity, with California alone having 12.9 percent of the national total. The total capacity was installed in 2,801 plants of 100 hp. or more, with 1,527 plants and 16,773,622 hp. represented by publicly and privately owned electrical utilities, and 1,274 plants and 2,094,405 hp. classified as "industrial and miscellaneous".

Copies of the report, known as "FPC S-14", are obtainable from the Federal Power Commission at ten cents each.

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Reopen Old Plant

The Missouri Public Service Company power plant at Pleasant Hill, Mo., idle since 1937, is to be placed in readiness for service, and tests are now under way to determine how much load the plant can carry and whether it would be kept ready for standby service to the Lake City munitions plant. Built in 1917, the plant has been rated at 2,250 kw.

Would Add 2,000-kw. Unit

Berea, O., City Council has approved an ordinance to hire an engineer to draw plans for the installation of a 2,000-kw. turbo-generator and auxiliary equipment at the municipal plant to cost about $219,000. Cleveland Electric Illuminating Co. has offered to buy the plant for $400,000 and provide the city with power at its Cleveland rates.

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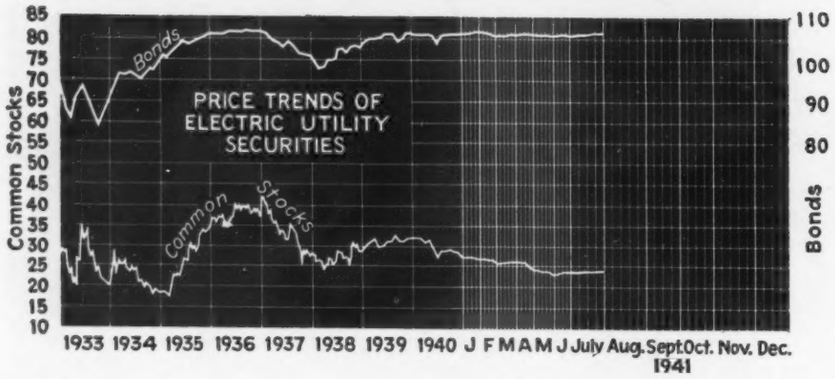
Forms REA Coop

Chautauqua & Cattaraugus Counties Rural Electric Co-operative, Inc., has been chartered in Cherry Creek, N. Y., and plans are in progress to build 125 miles of rural lines in portions of the two counties. REA financing will be sought.

Utility Securities Hold Previous Levels


PRICE TRENDS OF ELECTRIC UTILITY SECURITIES
Bonds
Common Stocks
Common Stocks
Bonds
85 80 75 70 65 60 55 50 45 40 35 30 25 20 15 10
110 100 90 80
1933 1934 1935 1936 1937 1938 1939 1940 J F M A M J July Aug. Sept. Oct. Nov. Dec. 1941

Electric light and power stocks and bonds showed little change in the most recent week. "Electrical World" index of stocks stood at 24.1, as against 28.8 a year ago; bond index was 106.0, against 105.6 last year

Fight Looms on Proposed C. & S. Stock Change

Commonwealth & Southern Corp. indicated last week it would fight in the courts any order by the Securities and Exchange Commission directing the holding company to revise its capital structure so that only common stock would be left.

At the same time, George Roberts, counsel for the utility, pleaded for consideration of the company's own plan for simplification, by which Commonwealth's preferred issue would be liquidated through a distribution of its holdings of common stock in the four Northern operating companies. The suggestion was taken under advisement by the SEC.

In filing its brief with the SEC calling for reduction of the utility's capital structure to one class of stock, the public utilities division expressed the view that existence of preferred stock can be justified only under "exceptional circumstances." The brief also cited divided arrearages on Commonwealth's present preferred stock which have been accumulating since 1935.

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Subsidiary Utility Act Exemption Denied

Securities and Exchange Commission has denied an application by the International Utilities Corp. and its subsidiary, Dominion Gas & Electric Co., for an extension of previously granted exemptions of the subsidiary under the Public Utility Holding Company Act. The exemption had expired December 31, 1940.

The application was denied, the SEC said, because P. M. Chandler, president of International, and other officers and directors "acted in wanton disregard of the fiduciary duties owed to the stockholders."

Partial exemption was granted to certain Canadian subsidiaries of Dominion Gas and International Utilities.

•

North American Light Postpones Meeting

North American Light and Power agreed last week to postpone until August 21 at least its scheduled meeting of stockholders to vote on dissolution of the company.

The postponement followed advice by the Securities and Exchange Commission that it was willing to negotiate in an attempt to reconcile differences growing out of North American Light's decision for voluntary liquidation.

•

SEC Denies Utility Plea

Securities and Exchange Commission has issued an order denying the applications filed under the Public Utility Holding Company Act by Paul Smith's Electric Light & Power & Railroad Co. and Paul Smith's Hotel Co. for an order that they are not subsidiaries of Associated Gas & Electric Co. system. An application by Gas & Electric Associates for an order declaring it not to be a holding company was also denied.

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Permits Contribution

Securities and Exchange Commission has issued an order permitting a declaration to become effective regarding a $2,035,000 capital contribution by American Gas & Electric Co. to its wholly owned subsidiary, Kentucky & West Virginia Power Co., Inc.

Northern States to Sell Properties

Moving toward dissolution, Northern States Power Co. (New Jersey) has filed application with the Securities and Exchange Commission to sell certain utility properties in Lyon and Sioux counties, Iowa, to South Dakota Public Service Co. for $40,000, and to dismantle its remaining facilities.

The application also covers the sale by Northern States Power Co. (Minnesota) of electric facilities in Fairview, S. D., to the South Dakota company for $5,000. As owner of all the outstanding capital stock of the New Jersey company, Northern States Power Co. (Minnesota) will surrender such stock for cancellation and receive in exchange all of the cash and other assets of that company.

Other recent SEC actions include:

Receipt of New York State Electric & Gas application for issuance and sale of 2.46 per cent $500,000 serial note to Rural Electrification Administration, proceeds to be used for rural line construction. Note will be secured by pledge of not more than $600,000 principal amount of the utility's 3¾ per cent first mortgage bonds, due 1964.

Postponement to July 23 of July 16 public hearing in Washington on "show cause" order under Section 14 of the Holding Company Act with respect to New England Power Association, New England Power Service Co., Bellows Falls Hydro-Electric Corp. and Green Mountain Power Corp.

Permitted Eastern Shore Public Service Co. (Del.), Virginia Public Service Co. and York Railways Co. to file consolidated excess profits tax return for 1940.

Dismissed application of International Utilities Corp. for order declaring it has ceased to be a holding company.

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Pay Dividend on Arrears

Directors of the Puget Sound Power & Light Co. recently voted a dividend of $1.25 a share on the $5 prior preference stock, which was payable June 15. There are arrears of $27.50 per share in dividends on the stock, which must be paid before the $6 preferred stock is entitled to dividends.

Utility Reports

	Net Income 1941	1940
‡Associated Electric and subs.	1,843,416	2,508,876
*Birmingham Electric	636,536	605,558
*Central Arizona Lt. & Pwr.	748,192	875,418
*Duquesne Light	10,354,741	10,391,326
§Electric Pwr. & Lt. and subs.	5,251,609	5,546,138
*El Paso Electric and subs.	542,446	466,455
*Mississippi Pwr. & Lt.	295,378	494,438
*Northwestern Electric	469,087	557,382
‡NY PA NJ Utilities and subs.	6,217,595	5,698,354
*Oklahoma Gas & Electric	2,647,141	2,750,588
*San Diego Gas & Electric	2,100,341	1,552,139
†Savannah Electric & Power	231,995	184,452

*Twelve months ended May 31
†Twelve months ended April 30
‡Twelve months ended March 31
§Twelve months ended February 28

Fluorescent Promotion Practices

Fluorescent on the March

FRANK R. INNES, *Managing Editor*

Electric utilities *are* promoting fluorescent lighting.

Some are far out ahead, marching right up with the band, many are content to go along with the main body of the parade and a few are straggling. The parade is moving.

Today there is much less of the "wait and see" disposition among utilities in regard to fluorescent than there was a year ago. Many have seen and have decided not to wait any longer.

This change is the direct result of the availability of competently engineered fixtures and lamp inclosures and of the knowledge, born of user experience, that satisfactory fluorescent lighting lies at far higher illumination intensity levels than does incandescent. Also, fluorescent is being integrated into the technique of lighting. It is taking its logical position in the lighting art alongside other lighting means as the places and purposes of its application are defined with increasing clearness. Choice, not economy competition, is becoming the determinant of its use.

This conclusion, that the utilities are getting going on fluorescent, comes from study of information and exhibits supplied by nearly sixty power companies, large and small, in all parts of the country. The evidence is reported in detail in the following pages.

A significant point, apparent clearly to the compiler of the following discussions, but because of the form of presentation not so readily seen by the reader, is that the utilities doing most in the promotion and sale of fluorescent are the ones that are discovering that revenue does not suffer, that trade relations are good and that the gyp salesman is becoming seldomer. Conversely, those less, or not at all, active in fluorescent promotion seem to be the ones that have the most trouble in these regards.

Grateful acknowledgment is made to the utilities* that co-operated with us in this study and to P. H. Powers, vice-president West Penn Power Company, for the form and method of it. Its elements were taken from his paper, "The Fluorescent Challenge," presented at the Edison Electric Institute annual sales conference last spring.

*Numbers after quotations in articles on the following pages refer to utilities listed on this page.

CO-OPERATING UTILITIES

1. Georgia Power Co.
2. Northwestern Electric Co.
3. Texas Electric Service Co.
4. The Detroit Edison Co.
5. Indianapolis Power & Light Co.
6. Columbus & Southern Ohio Electric Co.
7. The Connecticut Light & Power Co.
8. Portland General Electric Co.
9. Monongahela West Penn Public Service Co.
10. Ohio Edison Co.
11. Southwestern Gas & Electric Co.
12. Peoples Power Co.
13. Cumberland County Power & Light Co.
14. Central New York Power Corp.
15. Southern Indiana Gas & Electric Co.
16. Duquesne Light Co.
17. West Penn Power Co.
18. Commonwealth Edison Co.
19. Virginia Public Service Co.
20. The Washington Water Power Co.
21. The Connecticut Power Co.
22. Western Massachusetts Electric Co.
23. Missouri Public Service Corp.
24. The Cincinnati Gas & Electric Co.
25. The United Illuminating Co.
26. Nevada California Electric Corp.
27. City Electric Light Dep't, Rochester, Minn.
28. Kentucky Utilities Co.
29. Kansas Gas & Electric Co.
30. Florida Power & Light Co.
31. Wisconsin Power & Light Co.
32. Arkansas-Missouri Power Corp.
33. Malden Electric Co.
34. Central Maine Power Co.
35. The Ohio Public Service Co.
36. Fort Dodge Gas & Electric Co.
37. Public Service Electric & Gas Co.
38. Edison Light & Power Co.
39. The Toledo Edison Co.
40. South Carolina Electric & Gas Co.
41. Central Vermont Public Service Corp.
42. Florida Power Corp.
43. New York Power & Light Corp.
44. The Kansas Electric Power Co.
45. Eastern Shore Public Service Co.
46. Wisconsin Public Service Co.
47. Boston Edison Co.
48. Central Hudson Gas & Electric Corp.
49. San Diego Gas & Electric Co.
50. Public Service Co. of Northern Illinois
51. The Montana Power Co.
52. Missouri Utilities Co.
53. Metropolitan Edison Co.
54. Pacific Gas & Electric Co.
55. Philadelphia Electric Co.
56. Blackstone Valley Gas & Electric Co.
57. Pittsfield Electric Co.
58. Puget Sound Power & Light Co.
59. Peoples Light Co.

Fluorescent Promotion Practices

Fluorescent as a Lighting Sales Tool

The customer buys, and the utility should sell, lighting—not kilowatt-hours of electricity. Here is a wonderful new development that has the elements of novelty, color flexibility, and economy to make a powerful appeal in lighting sales.

Is it being used effectively, with full appreciation and employment of its values and qualities? How is your company using this sales tool? And with what results?

The general conclusion to be derived from the tone and content of the replies on this point is that the utilities are sincerely promoting fluorescent lighting in terms of their customers' and their own best interests. The replies indicate that what at first appeared to be a utility attitude unfavorable to fluorescent was simply and only a sensible disposition to await more knowledge and better understanding of what the new light source was, what it could do and how it should be applied. With knowledge and understanding becoming continuously more definite and more widespread, utilities are accepting fluorescent lighting as a worthy addition to their services to the people and are using it as a lighting sales tool.

Demonstrations, Trials Are Convincing Sales Arguments

Next to high intensities in effectiveness as a sales tool, according to the replies, come demonstration and trial installations supplemented by outstanding local jobs that can be pointed to as examples. Pictures of such exemplary installations are used effectively in direct mail advertising and by salesmen. Emphasis in these efforts is, of course, on the proper application of fluorescent so that its advantages may be realized to the fullest and its limitations minimized. The need for this kind of sales effort and the reason for its general use by utilities arose obviously from the poor and unsatisfactory installations made by the one-profit operators who sold tubes and tinsmith fixtures on the easy appeal of "cut your light bill in half."

"Demonstration and trial installations have been utilized, and showing representative installations on our own premises and in the places of business of other progressive firms." (2)

"Don't sell a lot of customers a little fluorescent, but try rather to sell a few customers a lot of it. Then you will have some good bellwethers who will help step up the lighting and the wattage of others." (13)

"In our monthly publications, *Commercial Electric Topics* and *Industrial Electric Topics*, we feature outstanding local fluorescent installations." (16)

"Our company has a relighting and remodeling program in which levels of 75 foot-candles are planned for district offices in key towns in our territory. We believe that installations of such intensities in our own properties will prove to be effective sales tools." (17)

"The efforts of our commercial department are devoted to securing above-the-average installations of fluorescent lighting in key locations." (19)

"Plans are being made to light our main office salesroom with combination fluorescent and incandescent to approximately 90 foot-candles. This, we feel, will be most helpful in securing better lighting in commercial customers' places of business." (29)

"By installing fluorescent lighting in company offices and on sales floors proper applications can be shown to our customers. These installations are now being made." (31)

"The company's fluorescent installations serve as showrooms."

"We have converted our selling largely from the broad front selling of better lighting to a large number of customers towards more intensive selling of outstanding fluorescent installations as example sales to prove the value of high level lighting and to encourage the selling of higher levels by the trade." (58)

Higher Intensities Help Selling

Ability to obtain much higher illumination intensities than heretofore were considered practicable is the one feature of fluorescent that is being mostly used as a lighting sales tool by electric utilities. This feature is either stated in definite terms or is strongly implied in almost every one of the nearly fifty categorical replies received on the subject. The greatly increased illumination possible with fluorescent is a double-barreled sales weapon. It gives the user an effectiveness and quality of lighting far better than he knew before and at the same time it protects the utility against the exaggerated ideas of bill reductions with which fluorescent made its first public appeal.

"We are stressing the fact that the customer may now obtain more light from the same quantity of kilowatt-hours rather than the same light for a lesser quantity and we are talking in terms of a minimum of 50 foot-candles." (3)

"We have learned through experience that fluorescent illumination of 30 foot-candles or less on working and selling areas is psychologically gloomy, drab and oppressive. Hence when we sell fluorescent to replace incandescent lighting we work on the basis of double the previous intensity or to a minimum of 50 foot-candles." (7)

"—a level of lighting nearer to what our eyes demand, that is, approaching closer to natural light." (8)

—"will give them (customers) all the lighting they need—50 foot candles or more." (10)

"One of the most valuable features of fluorescent lighting is its practicability for use in obtaining desired higher levels of illumination." (17)

"In most instances fluorescent has helped to sell better lighting jobs at practically the same or even more wattage." (21)

"We have found that many of our customers will accept fluorescent lighting intensities well within the upper limits of the intensities specified." (24)

"We have recognized in fluorescent lighting a means for obtaining desirable lighting levels that heretofore were practically unattainable." (28)

"We find it an excellent tool for selling high intensity lighting." (34)

Good Results Are Obtained

Although customer interest in fluorescent remains high, its novelty appeal is declining as a factor in selling. People are getting used to it. For certain applications, such as in cafes, restaurants and amusement places, the color resources of fluorescent are of definite sales value, but it is probable that this feature is of somewhat less importance than was first expected. The coolness of fluorescent, as against the comparatively high heat release of incandescent lighting, is apparent as a determining sales factor in numerous cases. These impressions are clearly retained in the mind after study of the replies.

The replies show also that, although the products of competent manufacturers are crowding jerry-built local fixtures from the field and the general quality of installations is rising, fluorescent lighting is still more bought than sold, particularly by small users. And it is still being bought with the idea that it will reduce the electric light bill. This, evidently, is a condition that only time will cure.

What are the results of these utility efforts to promote fluorescent and its proper application? It was not expected that the replies would justify any more than an impressionistic answer to this question. The general impression is that the results have been good, that there is an observable improvement in the ways that customers regard and use fluorescent. Some replies comment that improvement is spotty or unapparent, but none say that no betterment is seen.

"While we are a long way from having one hundred percent adequate and proper installations there is a decided improvement which we feel will continue as the influence of the good installations more and more offset the influence of the earlier poor jobs." (1)

"Results are never quite satisfactory. Some progress is being made in overcoming the effects of bare lamp poor quality installations." (2)

(Referring to a promotional campaign) "Several excellent lighting jobs resulted, but the smaller jobs were not touched by this activity." (5)

"Fluorescent has definitely helped to make people more light-conscious and has given a new impetus to all kinds of lighting promotion." (6)

"We believe our customers are becoming more acquainted with the values of much higher foot-candles using fluorescent lighting than they were a year and a half ago." (10)

"Fluorescent lighting has given added impetus to our 'Light for Seeing and Selling' program and has created a widespread acceptance of higher lighting levels by the public." (11)

"Our definite stand in favor of fluorescent lighting unquestionably assisted us in retaining the confidence of our customers. Through it we were successful in dispelling the idea that we were against fluorescent and as a result our representatives were called as consultants on many jobs that otherwise might not have been available to them." (16)

"Fluorescent lighting practice is greatly improved here today over what it was a year ago." (18)

"We have every reason to believe that satisfactory results are being obtained." (27)

"We believe our results have been most favorable, both from a revenue increase and from a public relations standpoint." (32)

"Results are very good." (33)

"The results obtained are a mixture of good and bad." (38)

"Good results; in over 1,100 jobs studied, practically all have better lighting and 74 percent had as much wattage or more than before." (55)

Fluorescent Enriches Lighting Art

Although a number of the replies tell of promotion efforts devoted wholly to fluorescent, the majority of them imply, if they do not definitely state, that fluorescent is regarded, not as a new development standing by itself, but as an enlargement and an enrichment of the resources of the lighting art. The prevalence of this attitude is undoubtedly the result in considerable measure of the rather unhappy auspices that attended the debut of fluorescent. But the attitude is logical and it is correct. And the utilities evidently are convinced that it will justify itself in the long run.

"In many cases fluorescent is sold as a supplement to incandescent or vice versa to obtain color qualities desired." (7)

"The company does not sell fluorescent lighting as such, but tries to sell good lighting regardless of the light source." (15)

"Fluorescent has supplied the utilities with a new tool to re-emphasize the story of Better Light-Better Sight." (17)

"The customer's individual problem is analyzed carefully and if under present cost conditions we feel fluorescent is best for him we unqualifiedly recommend it." (23)

"We attempt to use fluorescent light for what it is, a new, efficient and flexible light source which is not a cure-all for every lighting problem but which certainly has its place in the commercial and industrial field." (25)

"The policy of the company is to promote and recommend that type of lighting which will most efficiently accomplish the purpose for which it is intended." (30)

"We have made a practice of planning lighting systems that will fit the

[*Continued on page 66*]

Fluorescent Promotion Practices

Utilities Use Fluorescent

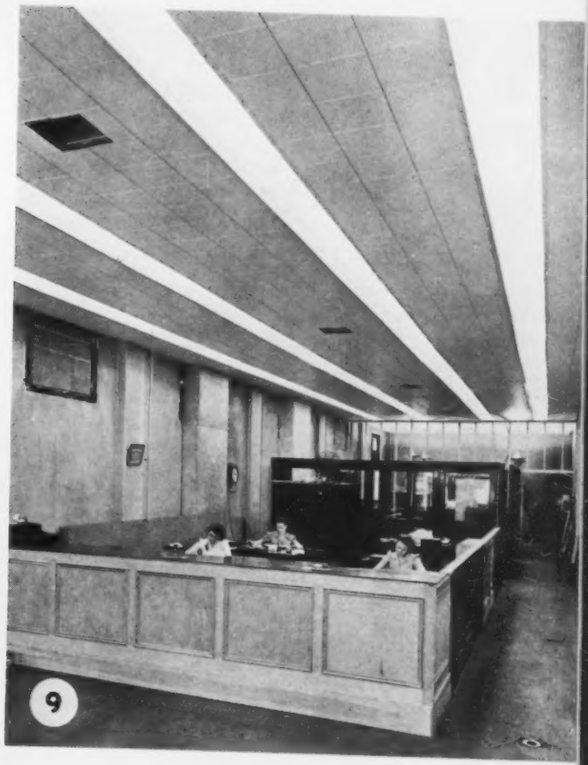
1 Main display floor, East Tennessee Light & Power Co., 75 ft.-candles.
2 Executive's office, Philadelphia Electric Co., 50 ft.-candles.
3 Accounting department, Central Hudson Gas & Electric Corporation, 50 ft.-candles.
4 Meter department, Central New York Power Corp., 150 ft.-candles.
5 General office, New York Power & Light Corporation, 50 ft.-candles.
6 Drafting room, Public Service Electric & Gas Co., 85 ft.-candles.
7 Branch office, Pittsfield Electric Co., 50 ft.-candles.
8 Drafting room, Commonwealth Edison Co., 85 ft.-candles.
9 Customers' office, West Penn Power Co., 75 ft.-candles.
10 Meter files, Florida Power Corporation, 75 ft.-candles.
11 Display window, Edison Light & Power Co., 700 ft.-candles (4,000 watts fluorescent, 4,000 watts incandescent).

at Fifty-Up

6

7

8



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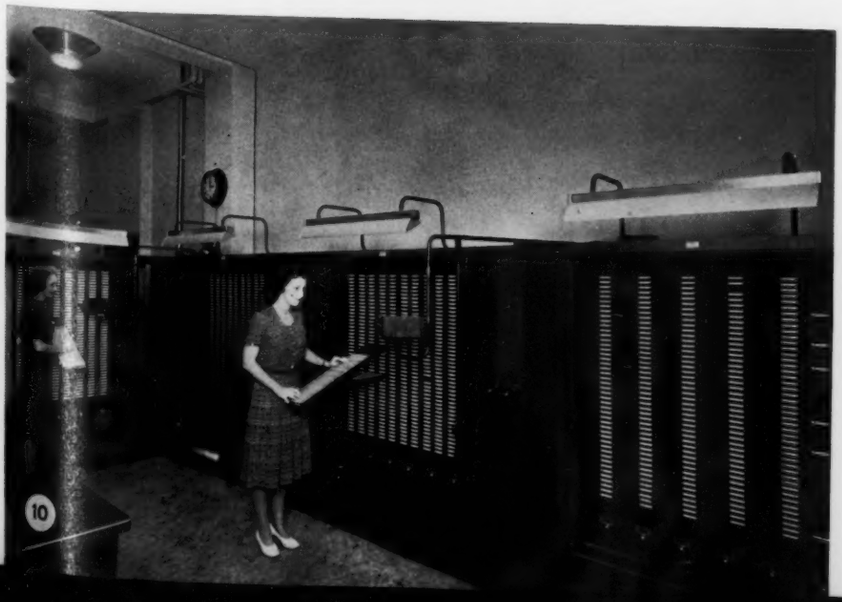

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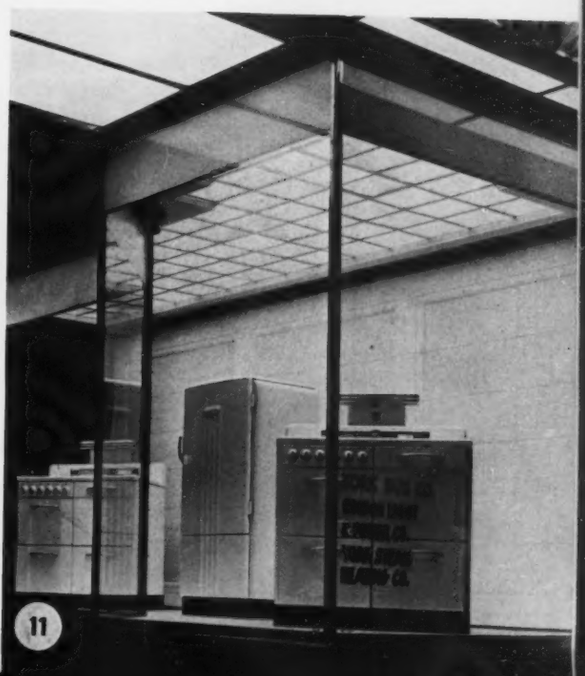

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customers' needs, whether it be fluorescent or incandescent." (32)

"Our company is treating fluorescent as another light source, the same as incandescent, mercury vapor, etc." (35)

"Fluorescent is another light source to be used within the physical limits of its ability to do any specific job better." (39)

"It is our policy to sell fluorescent lighting on the same basis as incandescent—Better Light-Better Sight." (45)

Must Prevent Dissatisfaction

Guidance of fluorescent application so that installations will be made properly and will be adequate in view of the characteristically higher intensities required for user satisfaction appears to be an important element in the utility conception of fluorescent promotion. This consideration is to be noted frequently in the replies. It is certainly true that the utility would suffer in the pocketbook if it neglected this aspect of the new lighting development, but it would be wholly unfair to conclude that protection of revenue is the single concern of the utility. Just as important, perhaps more important, is the fact that the utility knows it will suffer if customers are dissatisfied, no matter from what original cause dissatisfaction arises. And if it failed to guard its customers against exploitation in matters related to electric service, the utility would in fact be blamable.

"We recognize our responsibility to our customers: that unless we promote proper use of fluorescent to provide adequate levels of illumination inadequate installations will be bought or sold." (1)

"The greatest responsibility of our lighting department is not the promotion of the lamp, but guiding its proper application and to this end we are bending every effort." (4)

"Our problem as a utility is to tell not just what fluorescent saves, but what it gives." (6)

"Soon after the introduction of the fluorescent lamp our company realized the need for utility leadership in directing its use and application." (16)

"When our lighting engineers work on a problem they attempt to arrive at the solution that is best for the customer." (25)

"The economy angle is presented faithfully when cost is an important factor." (26)

Salesmen Training Essential

It was to be expected that in the first years of fluorescent lighting a considerable part of the utility effort should be devoted to educating and training sales personnel in the new thing that had appeared on the earth. At first this educational effort was simply to impart knowledge on the operation of the new lamp. At that time there existed no significant body of information on proper application of fluorescent lighting. But information accumulated rapidly, mostly of pragmatic kind, and continues to do so, but more now of quantitative engineering nature. In this condition of knowledge continuously enlarging and becoming more specific, salesmen training is essential to intelligent sales effort.

This necessity is definitely recognized in the replies in many instances and is implicit in all of them.

"We have continued this policy of keeping our salesmen up to the minute on fluorescent, to help them utilize it fully as a new sales tool and to assist our customers in applying it properly and also to prevent poor installations." (1)

"We endeavor to train our salesmen in the proper technique of selling fluorescent so as to give our customers better lighting results." (2)

"The fact that the lighting salesman knows the story of fluorescent from beginning to end gives added prestige to his position as lighting adviser." (17)

"We are constantly endeavoring to raise the sights of our salesmen and encourage them to sell customer benefits." (20)

Organization for Fluorescent Sales

Utilities are accustomed to selling lighting as a load builder. Fluorescent cannot be sold on that basis alone. Customer satisfaction, and the utility's duty as a servant, must be recognized more preponderantly than before.

This change in sales philosophy necessitates changes in sales organization, in rating of sales accomplishment, in sales methods and in training and compensation of salesmen. How is your company handling this problem?

It seems quite plain from the replies to this question that fluorescent is not such an upsetting element in utility lighting sales organizations as might have been expected. It has introduced complications into methods for evaluating sales accomplishments of both departments and individuals. But these complications appear to be more in the nature of temporary bothers than of abiding difficulties. The bogeyman of reduced loads and lost revenues that haunted utility thinking in the early days of fluorescent apparently has not materialized as much as was feared and seems to be fading out. High levels of illumination and long hours of use are exorcising that goblin. Fluorescent has accelerated and enlarged the lighting sales job and nobody is going to crab about that.

Should Have New Terms for Sales Accomplishment

Only four of the replies received on this question speak definitely of fluorescent having made necessary any revision of methods for calculating compensation of salesmen. And since sixteen state that salesmen are paid straight salary and several others imply the same, it would appear that fluorescent has not introduced any particular complications into the matter of salesmen's compensation and probably will not do so.

However, in regard to evaluating and rating lighting sales accomplishment the replies indicate that sales executives appreciate that wattage of new load added is no longer a competent yardstick and are searching for a new unit of measurement. Companies are studying the effects of fluorescent load on revenue, on energy consumptions, on power demands and on load factors, trying to arrive at a common denominator for effort and performance in lighting sales. Some companies feel they have the answer in the application of ratios or multipliers to bring fluorescent and incandescent sales to comparable bases, while others figure both kinds of lighting in terms of lumens sold.

Some replies state that wattage sales quotas have been reduced in order to compensate for the greater efficiency of fluorescent.

Concerning methods for rating or scoring performances of individual salesmen, a number of replies said that no change had been necessary. These are from companies that use records of calls made, of improvements in customers' lighting, of jobs closed and other evidences of enterprise and activity as the bases for ranking their men rather than simply the quantity of load added. In several other cases it was stated that methods of scoring were being changed.

"Where fluorescent replaces incandescent we give the lighting salesman credit on the basis of lighting improvement rather than on kilowatt load." (1)

"Salesmen's accomplishments are measured by the number of contacts and lighting surveys made, not by wattage added alone." (6)

"We do not compensate our men in terms of their sales accomplishments, but rather on the basis of the man's ability to do a good job, regardless of obstacles." (8)

"Recognition of existing conditions is testified to by reduction of (wattage) sales quotas to the tune of 20 percent below normal expectancy for 1941." (14)

"The higher lighting levels recognized as necessary today, increased industrial and commercial activity and increased operating hours that often result from fluorescent lighting all help to maintain sales on a par with past accomplishments." (15)

"We have set up a method of classifying fluorescent installations according to quality. Instead of kw. load increase, we changed the basis of scoring to lumen increase, applying a multiplier of 40 to fluorescent wattage and one of 20 to incandescent." (16)

"Credits for 50 foot-candle installations; credits for no-lost-load fluorescent relighting jobs." (20)

"For the past eight months we have been keeping accurate and complete records on every new lighting job and in time we will have enough data on which to determine what is the fairest and best way to evaluate fluorescent lighting installations." (25)

"We have been searching for a better method (than load building for rating sales accomplishment) but to date we have found none we believe would prove more satisfactory." (32)

"We are as much interested in load retention as in load building and our present record shows salesmen's accomplishments to our satisfaction." (35)

"All "F" lamps are considered on salesman's bonus for kw. increase at double the reported wattage, provided that high power factor equipment is used, that there is an improvement in lighting and that there is no more than a 50 percent loss in wattage for any given outlet or area. For example—incandescent load of 2 kw. is replaced by fluorescent of 1.5 kw. Salesman gets credit for 3 kw. fluorescent minus 2 kw. incandescent or 1 kw. increase." (39)

"To evaluate sales effort so that comparison of progress over previous years can be made, fluorescent installations are reported on a corrected lumen basis in terms of its incandescent equivalent." (43)

"We allow salesmen wattage credit on all fluorescent general lighting installations for all load over the average wattage density of early fluorescent trends." (58)

More Lighting Men Are Needed

As was to be expected of a new product offered to the user, fluorescent is helping to reduce unemployment. This effect is beginning to appear in lighting sales departments of utilities. Evidence of it shows in the replies here discussed. In several of them are remarks concerning increased personnel, more man-hours per lighting job and more jobs requiring comprehensively engineered layouts.

"We find that we are doing considerably more layout and design work than was the case with incandescent." (3)

"Our commercial and industrial lighting advisers are circulating more extensively." (14)

"We have increased our commercial sales force, a move which placed us in better position to contact the low use customer and further to guide the development of fluorescent lighting with commercial customers." (16)

"One man now on full time as lighting engineer, previously a part time job."

"We are giving consideration to increasing the number of salesmen in order that we may get better cover-

age of our commercial customers." (24)

"Our main change here is that we are spending more man-hours on lighting and on fluorescent in particular." (33)

"If ever the electric light and power industry needed expert lighting engineers, it is at the present time." (41)

"Actually we make far more fluorescent layouts than incandescent." (47)

Can Build Load With Fluorescent

Three replies took issue with the opening statement of the question by asserting that fluorescent could be sold as a load builder. Several others stated belief that load losses due to fluorescent would be only temporary and would be recovered as higher lighting levels became more common. Comments to the effect that reductions in connected loads were compensated for by longer hours of use with resulting equal or increased revenue were frequent among the replies. (Additional detail on this point will be found in the discussion of "The Fluorescent Load in Development").

"Preliminary investigations indicate our kw.-hr. sales will not be materially affected." (1)

"It has been proved that when new and more efficient electrical devices are placed on the market they eventually increase the use of electric service. It is true that for a short time the utility will suffer some loss of revenue. However, with an aggressive promotional and advertising program, emphasizing the benefits of a new device and the advantages derived from its proper application, there will be more of them used for longer periods of time, which represents net gain to the utility." (4)

"High levels of fluorescent lighting lead to longer burning hours and to substantial increases in revenue even though the connected load may be reduced." (5)

"We find that by stressing higher levels of illumination, by emphasizing the sales appeal of better lighting and by obtaining better customer satisfaction from fluorescent lighting, our revenue has been holding up." (8)

"From an over-all standpoint we do not feel that any revenue has been lost because of fluorescent lighting. We feel rather that some increase has been secured and that more will accrue in the future." (11)

"Customers still use such a little bit of light compared to the ultimate amount they could use in their best interests that we think with the benefit of fluorescent lighting we can now reach a commercial compromise on higher intensities which, while still far short of the goal, are sufficiently high so that we can continue our load building operations." (17)

"We find that as the customer realizes the value of this light source he will always add to it." (22)

"Fluorescent lighting can be sold as a load builder. The majority of commercial customers do not have sufficient light for easy seeing and good merchandising. If fluorescent is properly engineered and sold the required levels (of 50 to 75 footcandles) can be obtained with satisfaction to the customer and with added load to the utility." (28)

"We find that in a great many instances fluorescent lighting, from the standpoint of recommended seeing levels, can be sold as a load builder." (30)

"We have been keeping a check on the total number of fluorescent installations and checking further the changes either plus or minus in their connected loads and kilowatt-hours used. We find in general that fluorescent produces more kilowatt-hours per kilowatt than incandescent, which is a healthy sign and tends to improve our load factor." (34)

Education in Fluorescent Lighting

Methods used to give to the public, to dealers, and to utility people, knowledge of the values, qualities, possibilities and limitations of fluorescent lighting. In addition to the sales and performance aspects there is also an engineering concern here. It has to do with voltage regulation in reference to tube efficiency and outage and with power factor. What has your company done in such educational work? Has your company made any investigations on effects of distribution conditions on fluorescent or vice versa?

Although the replies show that the utilities have done and are doing in total an immense amount of educational work on fluorescent in the electrical trade and among users the effort is not evenly distributed. Some companies are doing a lot and some little or nothing. Also one can not help wondering after reading the replies if any utility has sufficiently exploited the opportunity for making favorable impression on the public mind that the advent of fluorescent lighting has so widely offered.

Several of the replies point out that the technicalities of fluorescent and of its application are of no interest to the public and one says in effect that the utility should not bother the customer with such matters. In the sense that the public usually blithely ignores efforts toward its education and that the customer has a perfect right not to give a darn how it works, this thing he is buying, so long as it does work, both of these opinions are correct. But the same public that refuses to be educated will flock to be entertained and the customer will quickly show interest when he begins to understand that how the thing works is a matter of dollars and cents to him.

Operation of Fluorescent Installations Should Be Watched

Before there can be education there must be knowledge. It was in the interest of this truth that the question on education was concluded with a reference to the effects on each other of fluorescent lighting and distribution conditions. Unfortunately the reference did not explicitly state that wiring was intended to be included in distribution conditions. Therefore many of the replies mentioned only the utility distribution systems, on which, as was to be expected, fluorescent lighting has had no observable effect as yet. But some, as in the following quotes, did bring up matters worthy of consideration.

"We have trained and equipped one man to investigate fluorescent troubles. He makes a thorough check of voltage regulation, operating conditions, faulty circuits, auxiliary equipment and possible lamp defects. This is done without charge at the customer's request. At present there is a considerable demand on this man's time." (4)

"We have found that there has been little need on our part to correct voltage conditions; however there have been a number of instances where fluorescent installations have necessitated the entire rewiring of buildings." (60)

"After a fluorescent installation has been completed a check is made and actual voltage, power factor and light intensity are reported to and discussed with the customer."

"Each fluorescent complaint generally necessitates an at-the-meter voltage check. In addition we always check at the improperly operating fixture; thereby assisting the customer in checking his wiring system capacity as we realize we can no longer feel that our voltage responsibility stops at the entrance." (23)

"We have contacted manufacturers in regard to low voltage conditions beyond our control and have suggested ballasts centered at 110 volts to correct the situation. We understand such new ballasts will soon be available." (47)

"We are having about the usual run of difficulty with fluorescent maintenance and operation and have recently issued a helpful bulletin to facilitate consumer analysis of these difficulties." (54)

"We have taken pains to acquaint people with the need for adequate wiring as a help to voltage regulation." (55)

Getting Power Factor Under Control

Power factor is an eminently proper subject for educative effort, not in terms of the fact that it is the cosine of the angle between current and voltage, but as it affects wiring and voltage regulation. Judging from the replies most utilities are disposing of this matter by the simple statement of service rules requiring certain minimums and leaving the customer to wonder what all the shooting is about.

However, some of the utilities are taking the trouble to explain that low power factor wastes wiring capacity and may cause trouble in tube starting and operation. In some cases the help of electrical inspectors has been enlisted in the cause. Perhaps the cooperation of manufacturers and of the trade is disposing of this problem in satisfactory fashion. The replies seem to indicate that this is the case.

"A small industrial customer called the other day and said that he had tried to buy low power factor fluorescent equipment from his local electrical supplier and had been refused." (6)

"Our standard terms and conditions require that all installations of fluorescent be corrected to at least 90 per cent and we have had little or no difficulty in explaining the matter satisfactorily to trade groups and to our customers." (11)

"The letter on power factor was signed and mailed out by electrical inspectors and was very well received by all concerned." (12)

"In announcing this (power factor) rule the advantages of high power factor were explained in a pamphlet mailed to all commercial accounts." (15)

"Usually any customer getting any considerable amount of low power factor equipment can be easily converted when he realizes he will probably have to rewire his store." (22)

"In this (requirement for 90 per cent power factor) we are getting fairly good support from contractors and jobbers." (41)

Opportunity in Fluorescent Education

When a scientific development emerges from the laboratory and appears on the market as an article for general purchase it is usually all nicely buttoned up with no loose ends of technical considerations hanging onto it. The public buys it as it is for what it is and applies it in the obvious manner of its use. But fluorescent lighting did not reach the market in this so-desirable state. Instead its technicalities could not be entirely confined to its production. They had to be considered intelligently in its application. Also it made its debut under false pretenses, so to speak. It was announced and received with much acclaim as a marvelous saver of money in an item of expense that political activity had made the public believe was excessive. And finally it was forced out of the laboratory onto the market really before it was ready.

These conditions have necessitated an immense amount of educational work the responsibility for which has logically devolved upon the electric utilities, which for their efforts earned only distrust and suspicion at first. In this connection it may be remarked that it is indeed fortunate for the utilities that the practical application of fluorescent lighting so far has been restricted pretty closely to commer-

cial and industrial uses, thus confining the effects of misconceptions, exaggerated ideas of economy and mistaken expectations of superlative performance to a comparatively small number of customers. If fluorescent had reached the market in a state of availability for domestic use then the wrong ideas and extravagant anticipations that accomplished its bow to the public would have made it not just the one hot potato—cooling nicely now, thank you—that the utilities have had on their hands, but whole bushels of high temperature tubers, the juggling of which would have been considerably more difficult, to say the least.

The educational work necessary to the sensible commercial development of fluorescent lighting has been touched upon frequently in the preceding discussions of this series and, it may seem, is sufficiently covered in them. Yet there are aspects of the work that may profitably be enlarged upon, particularly certain methods in addition to the obvious ones of meetings, schools and informative publicity for the user and for the trade. For instance, how many utilities are capitalizing on the opportunity to cater to the popular appetite for information on scientific marvels that fluorescent offers them? The replies show that some are and are getting results therefrom. How easy it would be for any utility to stir up a popular lecture on the wonders of fluorescence, invisible light, energy radiation and so on, exactly the same kind of thing that thousands stood in line for at the recent World's Fairs and that utility men themselves are treated to at manufacturers' lighting conferences. Such lectures, entertainingly presented with well-staged, simple demonstrations easy to prepare by any bright meter tester, can be kept going continuously at meetings of lunch clubs, women's clubs, church and society groups, etc., not only in small towns but the big ones as well.

"The principles of fluorescent light lend themselves to very dramatic demonstration. Such demonstrations are always welcomed by luncheon and civic clubs, schools, P.T.A.'s and many others. We have taken full advantage of this to tell not only the fluorescent, but the Better Light-Better Sight story as well." (11)

"Representatives of our lighting sales department have talked about fluorescent lighting to numerous organized electrical industry and public groups such as contractors' associations, maintenance men, Kiwanis, Rotary and others." (18)

" We have been giving talks to different service clubs, telling them about fluorescent lighting, its possibilities, qualities, values and the efficient use of different types of tubes such as daylight, 3500 degree white and soft white." (10)

"Consumer education is carried out by demonstration lectures put on by the commercial representatives to consumer groups such as civic clubs, chambers of commerce, manufacturers' associations and many other groups welcoming an instructive and entertaining program. Black light, ultraviolet, fluorescent and infra-red demonstrations are made." (58)

The Fluorescent Load in Development

Many installations, particularly small ones, are being made without utility knowledge. In total these are becoming important, perhaps not yet in terms of gross revenue and of system load, but of concern to the utility in relation to problems of distribution and of customer relations. Therefore, in its own interest, the utility should make real effort to keep itself informed of all fluorescent installations so that all possible errors, inadequacies or misconceptions can be corrected before customer dissatisfaction results. The article will tell how current information on installations is obtained, how recorded and how used, and also what typical points of error are to be looked for in the customer's installation. What is your company's practice in this regard?

Power factor rules and rate clauses are referred to often enough in the replies to indicate that utilities are watching this aspect of fluorescent load development closely. On the other hand the replies do not so frequently mention trouble in this respect as to make it appear that low power factor is as much a danger as was feared at first. Evidently the attention given to this condition in the early days of fluorescent had a wholesomely corrective effect and the problem is becoming less acute.

All in all it appears from the replies that the fluorescent load is developing in perfectly healthy fashion even though in some respects it got off on the wrong foot at the start. In the long run—not so long either as appears from these present indications—fluorescent, like the tungsten and gas-filled lamps before it, will take its place as a builder of utility load and revenue. And in so doing it will add much to the already rich values of electric service.

Can't Keep Track of Small Jobs

Probably every utility would like to have a complete record of all fluorescent lighting jobs in its service area. Most of them try to keep as good a record as they can and all, of course, have information on installations in the planning of which utility men were concerned. These are usually the larger, more important installations. But as regards the smaller jobs installed without utility knowledge, some companies just throw up their hands and make no effort to keep track. This is particularly the case with utilities serving big cities. Those serving smaller communities find it much easier to round up the information by salesmen's calls and through contacts with contractors, dealers, jobbers.

Of the replies, twenty say efforts are made to check all installations and eight state that accurate check is accomplished, while four report that no attempt is made to keep complete record. That there is no effective way to get information on all installations is asserted by six replies and fifteen agree that information gathered by salesmen in their calls and obtained from dealers, contractors and jobbers is the principal reliance. A couple of replies from utilities more fortunate than most claim accurate records because of local regulations requiring any kind of fixture installation to be done by a licensed electrician who must report each job.

"We have found no way of being apprised of all fluorescent installations going in. Through dealer contacts, check of electric permits, personal observation, news notices of remodeling, etc., we attempt to keep informed." (2)

"It is difficult to watch every installation of fluorescent lighting in the metropolitan area." (4)

"We attempt to check all fluorescent installations in two ways—each lighting consultant tries to keep track of all installations in his territory and rate men, whose job it is to take connected load counts in all customer establishments in course of time, check all the lighting installations throughout the service area." (10)

"The smaller merchant is more likely to buy equipment without investigation or advice and it is impossible to contact all these smaller establishments regularly." (15)

"We do not attempt to keep a record of every fluorescent lighting installation in our territory." (16)

"Our territory is of such nature that we have fairly close personal contact with most of our commercial customers and while we cannot keep up with all installations we do know most of them." (19)

"We are attempting to keep in touch with all new installations." (20)

"We have very good cooperation with contractors. What we don't hear about, they bring in." (22)

"We find it physically impossible to keep track of all the small installations made in our territory." (25)

"Our local ordinance prohibits the hanging of any type of lighting fixture without taking out a permit; all work is subject to inspection." (27)

"Through our system of contact calls and close observation of customer changes we keep posted." (33)

"We have enough men to cover the territory adequately—one representative for each 600 meters and eight who call daily on dealers and contractors." (35)

"We do not see how it is economically feasible to keep in contact with all the small installations." (54)

Complaints on Peddler Sales

Complaints from customers who bought fluorescent lamps and fixtures from peddlers are beginning to show up to some extent as a corrective of the utility's usual inability to keep track of smaller installations. And, strangely enough in view of the main reason for purchase of the gyp units, some of the complaints are of high bills. The customer expected his bill to be cut in half. Instead it remained nearly the same as before or even rose a little. The customer never realized he was using the new lights much longer than he did those he had before. Other complaints arose from the characteristic falling off of light intensity after the initial hundred hour use, from tube burnouts and from various faults such as "snaking," winking, slow starting, etc., on which the customer brought his troubles to the utility because either he could not find the seller of the fixture or could get no satisfaction from him.

Typical of the errors so often found in these installations are:

Bare tubes that in time become an annoyance to the eye.

Low intensity of illumination.

Units hung at existing outlets with no regard for light distribution.

Objectionable color quality, particularly in food stores and beauty shops.

Poor ventilation of tubes causing shortened life.

Unsatisfactory operation resulting from low voltage caused by inadequate wiring.

Failure of auxiliary equipment.

In order to discover and as well as possible to correct these bad conditions and also to get a line on the effects such installations are having on loads and energy usages some utilities are making surveys. Several reports of surveys which accompanied replies bear out statements in the discussion of "Organization for Fluorescent Sales" to the effect that where high level fluorescent lighting is installed connected wattage is not significantly reduced and that longer hours of use hold up kw.-hr. consumption. Of a total of 38 installations covered in these reports only two show fluorescent lighting intensities of 50 foot-candles or more; most of them lie in the range from 10 to 30 and three are below 10 foot-candles. And at that fifteen of the installations show increases in actual revenue or in E.A.R. No more convincing evidence than this is needed to prove that when fluorescent lighting is *sold*, not just bought, utilities need have no fear of revenue loss from it.

"By progressive selling, even to the extent of replacing inadequate fluorescent jobs, we have been fairly successful in keeping to a minimum installations that might cause customer dissatisfaction." (1)

"Usually our first information about the smaller installation comes from the customer's report that his new fluorescent tubes are not working properly. In the big majority of cases we find that fluorescent lighting is merely calling attention to inadequate wiring conditions that have existed for years." (5)

"We have had several customers who were dissatisfied because they believed what the fly-by-night salesman told them, but we have done much to correct this situation." (10)

"The most common error found in fluorescent lighting (in the smaller jobs) is the tendency to install fixtures at existing outlets." (15)

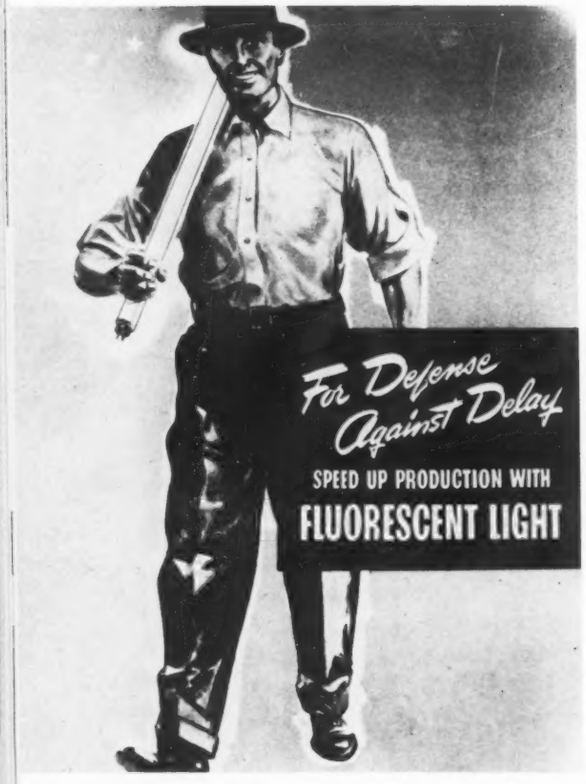
"We have been able to make out-

[*Continued on page 74*]

Fluorescent Promotion Practices

Utility Fluorescent Advertising Turns from Informing to Selling

Judging from the 127 examples of advertising and other publicity submitted by 41 of the 56 electric utility companies that cooperated in this round-up of Fluorescent Promotion Practices, the form of advertising most used is direct mail. Only 24 of the examples, and these offered by only 7 utilities, were newspaper or other publication space advertising.



THE NEWEST LIGHT SOURCE

Fluorescent Lamps

...what they are... how they work

The idea of a Fluorescent light source has long been in the minds of scientists. Centuries ago, it was first discovered that many hundreds of rocks, chemicals, organic and inorganic substances have the property of becoming luminous, or fluorescent, when exposed to certain radiation. From the continued study of this phenomenon has come the development and refinement of what is now known as Fluorescent lighting.

Fluorescent lamps, made possible by these discoveries, are amazing new sources of light. They are slim glass tubes, giving off richly glowing illumination like daylight or in abundant color. They do not contain filaments like ordinary bulbs and tubular lamps. Light is produced through the agency of invisible radiation acting on fluorescent powders with which the inside of the tube is coated. This radiation is created by the flow of

Other advantages are inherent in the Fluorescent lamp. It permits higher lighting intensities with existing wiring *when used with proper auxiliary equipment.* The surface temperature of the Fluorescent lamp is so low it can be touched without discomfort. Because light is emitted quite uniformly from the entire length and surface of the tube, glare is reduced and Fluorescent lamps are therefore often useful for exposed lamp applications.

Fluorescent lamps for stores, shops, theatres, restaurants, offices and businesses of many kinds are offered in a variety of sizes including 48 inch (40-watt) 36 inch (30-watt), 24 inch (20-watt), and 18 inch (15-watt). And although no equipment is as yet widely available for

CHANGE in direction of advertising. At upper left and below are samples of the now-developing direct selling appeal and at right the passé expository form

All the rest, except for three text stories in publications, come under the head of direct mail.

Looking at these examples of advertising, two obvious classes or divisions immediately suggest themselves. In one group would fall what might be called the expository kind of advertising—what fluorescent is, how it works, what it's good for, what it isn't good for, its values and its limitations. It might almost be said that some of these were written in a vein of warning. Of all the examples submitted nearly one-half could be shoved right into the pigeonhole as being of definitely expository nature. Only about one-fifth of the total number would be classified as of exclusively selling nature, expatiating enthusiastically on what fluorescent lighting will do for the user. In the remaining examples emphasis appears to be about evenly divided between explaining fluorescent and selling it. The over-all picture is thus about 65

per cent exposition and 35 per cent selling.

But this is not a fair, not really a true, picture. The writer remembers from a year ago when he made a less ambitious survey of utility activities in fluorescent*, that then practically all the advertising examples he collected were of the expository kind. It appears, therefore, that from then to now there has been a healthy development in utility fluorescent advertising, the emphasis on selling rising from almost none a year ago to a substantial proportion today. This conclusion is fortified by examination of the dates that appear on some of the examples. Almost all of the advertisements definitely classifiable in the expository group are of earlier vintage than those that carry a positive selling message. Consequently it may be said with confidence that in their advertising and publicity the utilities are pretty well past the stage of explaining what fluorescent is and isn't and are now getting a good start on selling it.

Of the 24 examples of space advertising, 16 are expository and 8 are selling and, significantly, are later in date. This same phenomenon can be found in the 56 examples from 10 companies of sales publications regularly distributed by some utilities to commercial and industrial customers. The copies of earlier date contain a larger proportion of expository material on fluorescent. In the case of the 36 examples of straight direct mail pieces from 19 companies the trend is unobservable because, although there are 17 pieces of expository nature and 18 of entirely selling emphasis, most of the pieces are not dated. However one feels almost sure that the selling pieces are of later production. Thus the analysis of this particular group may be said to bear out the conclusion that emphasis is definitely shifting to selling which was reached for the whole set of examples.

Although the trend toward greater emphasis on selling fluorescent is plainly to be seen in the examples of advertising it must be noted that it appears most definitely in the advertising of comparatively few companies. There are still a lot of utilities that seem content to allow fluorescent to be bought even though they advertise it in selling terms. From their replies to the questions discussed in the preceding articles of this series it is certain that these companies are making sincere efforts to assure that their customers will get all possible benefits from fluorescent lighting. But the note of warning seems to be implicit in their most enthusiastic selling talks as if they were saying, "Here's fluorescent. Isn't it swell? Look how it boosted sales for George Spivak in his gent's furnishing store. You want some? That's fine. But be careful you get the right kind of installation. We'll be glad to help you on that." Real selling advertising would not include the last two sentences. They would be left for verbal communication.

The greater use of various forms of direct mail than of publication space advertising is easily understandable. At present fluorescent lighting can be sold to only a comparatively small number of utility customers and direct mail is the less expensive and the more effective way to carry the selling message to them.

MANY UTILITIES employ customer-circulated house organs for fluorescent promotion

* "Electrical World," July 27, 1940, page 40.

standing fluorescent installations in the various communities of our territory. These have set the pace for the low use customers." (16)

"In most cases it has been found that customers are anxious for information about 'snaking,' flicker, early lamp failures, etc." (26)

"Our men have made calls on customers who bought fluorescent rather than lighting. In many cases the customer was not entirely satisfied and was anxious to obtain additional information and sometimes was willing to make corrections." (28)

"Customers in many cases were satisfied until the lamps began losing initial efficiency. They also found they did not save as much as they expected because they used the fluorescent lamps longer than they did the incandescent." (34)

"The most prominent mistakes are misapplication, bad spacing of units and inferior equipment sold by men having very little, if any, lighting knowledge." (35)

"Some of those who bought simple fluorescent fixtures from a peddler are coming to recognize that their lighting does not measure up to installations in their competitors' places of business." (41)

"We are now making a survey to ascertain the results of fluorescent installations and to determine their use in our territory." (45)

Dealer Cooperation

Many dealers have grabbed fluorescent for its profit possibilities. In this there is danger to the utility and to the dealer himself, danger that can be avoided only by dealer and utility working together harmoniously. Responsibility for cooperation is on the utility, because, clearly, the danger to it is greater. How, and with what arguments, have dealers been shown that it is to their own best interests to work with the utility? And what have been the results? What has your company done in this direction?

The replies on this matter of dealer cooperation were in most cases voluminous in detail of meetings, schools, mailing pieces, plans for organized mutual activities, utility services, etc., thus indicating that the subject is one of real concern. A significant feature of the replies, pointing to a condition that deserves consideration, is the fact that the least faith in the possibilities and the values of dealer cooperation appears to be in the large cities.

Profits for Dealers and Contractors

Evidently the most effective way to get and to hold cooperation of dealers and contractors in fluorescent promotion is to establish confidence in utility sincerity among them so that they will utilize the services of utility men in selling and planning installations. This conclusion is justified by the fact that 22 of the replies state that dealers make large use of the sales and engineering services offered by the utility. Twelve of the replies mention organized regular personal contacts, thus implying this as the means for establishing such confidence. In other replies the same idea is to be seen although not stated in so many words.

All except a few of the replies speak of informative meetings and schools held to acquaint dealers, contractors, jobbers and their men with fluorescent lighting, its technical aspects, values and limitations. The principal difficulty of these efforts appears to be a certain disposition to stay away from meetings on the part of the people they are intended to educate. At the beginning of fluorescent activity, for reasons well known, there was more than a little suspicion of the utility attitude toward the new light source, but this feeling appears now to be evaporating as the trade sees that cooperation with the utility is productive of more, and more profitable, business. The change in feeling is being caused by several things. One is the growing realization by users and sellers of fluorescent that it is not simply a new kind of light with only one value, that of reducing the electric bill. Experience is proving that that value is more imaginary than actual and that fluorescent and incandescent lighting are not comparable in every respect, that each has its particular usefulness and is more complementary to than competitive with the other. The large amount of informative publicity in publication advertising and direct mail put out by the utility has had marked effect also. But probably the one thing that has most strongly operated to remove suspicion of the utility from the minds of contractors and dealers is the fact that they profit from utility promotion in sales of fixtures and in installation work. In many cases the utility actually sells and engineers the jobs and then turns over the furnishing of fixtures and the installation of them to the local trade.

For these reasons it may be said without any considerable qualification that the utilities and the dealers and contractors are really getting together on the job of putting fluorescent to work in proper fashion. Some twenty of the replies said either that relationships with the local trade as regards fluorescent were good or that improvement was clearly apparent. A few indicated a "what's the use, you don't get anywhere" feeling about dealer cooperation, but the strong general impression from reading the replies is that fluorescent provides a fine opportunity for improving local trade relationships and is being so used.

"The cooperation and results, while always open to improvement, have been satisfactory." (1)

"This effort (a series of league meetings) proved very beneficial in gaining greater cooperation among the contractors who sell and install the smaller jobs." (5)

"We have offered to all the use of our engineering and blueprint service. The dealers know that we are unbiased and they use our recommendations to help sell the job." (6)

"Our best results in dealer promo-

tion of fluorescent lighting are accomplished through the efforts of our salesmen. When the dealers learn that we can aid them with their proposals and lighting layouts they are more than glad to ask for our assistance." (8)

"In 80 percent of the jobs worked on together by utility lighting consultants and by jobber salesmen more units were sold than had at first been considered. This is an excellent argument to use when seeking cooperation from other dealers." (10)

"Systematic, regular contacts are maintained with supply houses, dealers, architects and contractors." (11)

"The results (of dealer cooperation) have been most effective and successful. We have had very little difficulty with the promotion and sale of fluorescent lighting in our territory. We have certainly avoided many of the difficulties that might have resulted from the activities of fly-by-night operators had we not earned this cooperation over a long period of years." (16)

"Perhaps the greatest effect has been in the experience of dealer representatives in working with our men. When the dealers find they can sell better jobs and more fixtures by cooperating with us they naturally become more desirous of doing so on future jobs." (17)

"As soon as the contractor found that he could sell better and bigger jobs—partially through our cooperation—he was anxious to do so, thereby increasing his own revenue." (21)

"Our men are in position to give a prospect more information than the average dealer and he usually welcomes assistance." (28)

"When we plan a lighting job we always sell the merchandise through the dealer; therefore the better the lighting job, the more profit for him. The results have been very satisfactory." (32)

"We cooperate with the dealers and are getting good reciprocity." (33)

"Many of the contractors and architects in our territory avail themselves of our engineers' services on practically every occasion." (41)

"No job of any consequence is being sold in our area without the dealer consulting with us." (42)

"Most dealers were scared stiff over the inroads of 'peddler competition' and have realized the need of cooperation if they are to sell the customer a good job." (46)

Fluorescent Promotion Practices

In Specific Terms—

Many of the replies were deserving of much more extended presentation than was possible in the method of brief quotations employed in the preceding discussions. Also, such treatment, effective in stating the general situation, results in a composite picture in which detail and definition are lacking. In order, as well as possible, to sharpen the focus for the reader, it appears useful to present a few complete replies on the one subject that seemed to draw out the most detailed answers, "Fluorescent as a Lighting Sales Tool."

The replies here given were selected as representative of utilities that appear from the instant evidence to be among the more active in fluorescent promotion. Many more could have been lifted out for presentation, but these seem to tell very well the story of attitudes and activities in terms of the single utility and may be taken as indicative of the direction in which the utilities are moving in their handling of fluorescent lighting as a service to their customers.

West Penn Power Co.

The increased interest and curiosity in fluorescent lighting has definitely resulted in more valuable contacts on coverage of commercial accounts. It has meant that the salesman now has more of an opportunity to get an audience in order to create a desire for improved lighting, using fluorescent as a spearhead for interesting customers. In this respect fluorescent has been a grand sales help in increasing potential prospects.

On commercial contacts, the fact that the lighting salesman seems to know the story of fluorescent from beginning to end gives added prestige to his position as lighting adviser, with the result that the customer is more readily sold on the higher type of installation which the utility representative recommends.

Fluorescent has, due to its inherent shape and characteristics, opened up a potential market for applications not readily adapted to incandescent sources.

Perhaps one of the most valuable aids of fluorescent lighting is its practicability for use in obtaining desired higher levels of illumination. Stressing the fundamentals of Better Light-Better Sight in the aim for higher levels using incandescent sources, a ceiling or top has been reached which has more or less provided a bottleneck in our growth toward increasing foot-candle intensities. Commercial promotion of fluorescent lighting in our territory has enabled us to sell key jobs throughout the territory at levels perhaps not practical with incandescent, yet definitely setting a standard of high intensity. This proves the adaptability of fluorescent for high-level lighting and its potential sales value.

Our company has a relighting and remodeling program in which levels of 75 foot-candles maintained are planned in district offices in key towns in our territory. With greater acceptance of fluorescent lighting and with customers appreciating that it will be the "lamp of tomorrow," we believe that installations of such intensity in our own properties will prove effective sales tools for creating the desire for higher-level installations.

Fluorescent has supplied the utilities with a new tool to reemphasize the story of Better Light-Better Sight—the reasons for higher levels of illumination to get customers thinking of proper application and light which fits the needs for which it is purchased.

Arkansas-Missouri Power Corp.

We have made a practice of planning lighting systems to fit the customers' needs, whether it be fluorescent or incandescent. One that will help him to increase his business or efficiency, and one that he is proud to own and *use*. The majority of

stores to which we render electric service have inadequate lighting systems; therefore, by following the above method, it has been our experience that kilowatt-hours show a good increase, while the customer has a more friendly feeling toward our organization.

This new development has presented us with many new problems, but its novelty has proved a great stimulation in creating interest in lighting, the color flexibility has been of little value in the section of the country where we render electric service, but the economy of operation has offered us a great opportunity to raise lighting levels to at least double the present illumination.

We are using this new tool to the best of our ability and acquainting the public with its advantages and disadvantages by direct mail and personal contact. Our employees, by employee educational meetings, and through loose-leaf lighting folders provided for them, have learned a great deal about fluorescent lighting. This service has also been made available for the electrical contractors.

We believe our results have been most favorable, both from a revenue increase and from a public relations standpoint.

Southwestern Gas & Electric Co.

Fluorescent light as a sales tool is being used effectively by our company

(a) To raise lighting levels to planes heretofore impracticable with incandescent lighting because of economic factors and inherent heat load.

(b) To obtain higher lighting levels on existing wiring capacities without producing overload conditions.

(c) To obtain special effects from an architectural and artistic standpoint, which can only be accomplished by fluorescent lighting because of the form of the light source and the high efficiency and wide variety of colors available.

Fluorescent lighting has given new impetus to our "Light for Seeing and Selling" program and has created a widespread acceptance by the public of higher lighting levels which serves to augment rather than retard the trend of lighting kw.-hr. sales.

Our friendly relationship with our customers has generally been considerably enhanced through the medium of fluorescent lighting because of the realization by them that our efforts are ever to give more for their lighting dollars.

Florida Power Corporation

The sale of fluorescent lighting in our territory received its inception several years ago, like many other parts of the country. Through our lighting engineers we were working constantly, but apparently were unable to make an impression sufficiently strong to the prospective purchaser to cause him to stop and think before investing his money. Several of the early installations began to give trouble from a mechanical standpoint, and the purchaser realized that insofar as his lighting results were concerned, he was worse off than he was before.

The several meetings held with the contractors and dealers in the early part of 1940 usually wound up with most of the emphasis being stressed on power factor equipment instead of lighting results that could be obtained through fluorescent lighting. It soon became obvious that if we were going to make a sincere effort toward selling fluorescent lighting, a different approach would have to be adopted. This resulted in the lighting men making it their job to individually contact dealers and contractors in our territory, as well as the jobbers, in an effort to convince them of our sincerity in wanting to help them in the sale of this equipment. The result of these contacts showed that they accepted our sincerity, and members of the Florida State Electrical Contractors Association located here in St. Petersburg organized a local association. The past two months have been devoted to weekly meetings at which fluorescent lighting was discussed in all of its phases, since the sincerity of purpose on the part of the company and the dealers' desire for more information and an opportunity to do a good fluorescent lighting selling job made such an impression that a program of fluorescent lighting promotion was then prepared (copy of it is attached) which incorporates the ideas of the jobbers, manufacturers and dealers, as well as the company's participation in this promotional program. This program when presented to the dealers was enthusiastically received and today, at the request of the Contractors' Association, the weekly meetings are being continued for the purpose of studying the installation and engineering problems.

Since the inauguration of this program, the members of the Contractors' Association, and jobbers, are making very good use of our services. As a matter of fact, no job of any consequence is being sold in our area without the dealer consulting with us for our lighting department advice.

Connecticut Light & Power Co.

Our lighting representatives have attributed their success in selling good lighting to the fundamental of:

1. Lighting for the customer's benefit:

(a) Light for production, greater accuracy, less spoilage and accidents in industrial plants.

(b) Light for seeing in offices.

(c) Light for selling in stores and other commercial places.

With the advent of fluorescent lighting, we have learned through experience that fluorescent illumination on working or selling areas of 30 foot-candles or less is psychologically gloomy, drab and oppressive. Hence on all fluorescent installations to replace existing incandescent, equipment is, in most cases, sold on "double the former intensity" basis, providing, of course, the new intensity will be greater than 30 f.c. However our goal is 50 f.c.—all fluorescent installations to insure cheerful illumination of benefit to the customer, and some increase in load.

In many cases, fluorescent lighting is sold as a supplement to incandescent or is supplemented by incandescent to insure color qualities desired. In this direction, load building possibilities are still prevalent, for a cooler high intensity fluorescent-incandescent combination often permits the customer to install an air-conditioning system of reasonable capacity, which means added load.

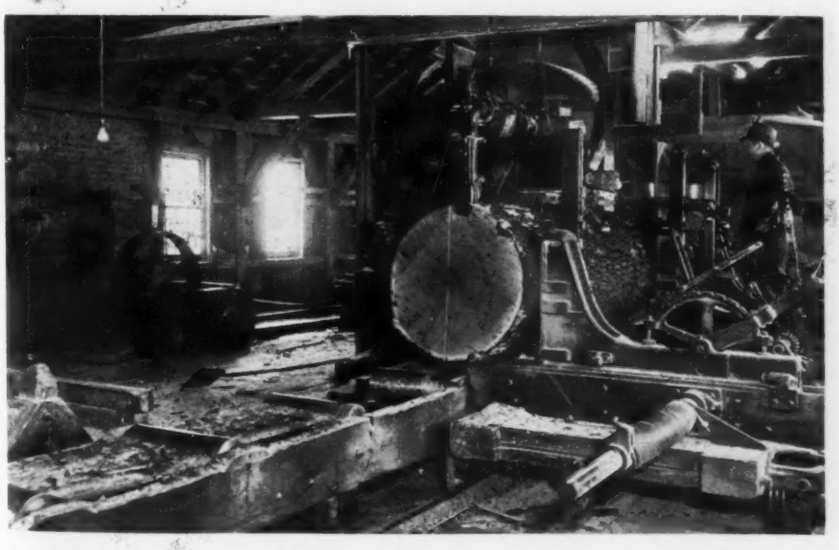
LOAD BUILDING

Motor Drive Boosts Lumber Production

Increased demand for lumber led to substitution of a modern electric motor for a steam-engine drive on a band saw and increased by 15 percent the number of hardwood logs cut every hour at the Moraches-Nowels Lumber Company, Columbia City, Ind.

The steam engine was used until increased business demanded more steam than the boiler could supply. Replacing the old steam apparatus with a Westinghouse 100-hp., 220-volt, three-phase, 60-cycle, squirrel-cage induction motor saved $2,500 on installation cost. Counting the savings effected through increased production, motorization will repay the original investment in less than ten months.

Power is distributed to the mill at 2,300 volts and the motor is supplied through three 2,300/220-volt transformers, which also feed other motors in the mill. The band-saw motor is controlled by a 220-volt auto-starter and a 400-amp. disconnect switch.



Rapidly increasing demand for lumber overtaxed steam boiler. Substitution of 100-hp., 220-volt, three-phase motor boosted production 15 percent, saved $2,500 on installation

GREENHOUSE frontage of Matthew I. Ruane, Newtonville, utilizes 8,500 10-watt blue lamps in trees, on lines of Boston Edison Co.

Florist Splurges in Decorative Lighting

In five years the florist establishment of Matthew I. Ruane, at 77 Walnut Street, Newtonville, Mass., has increased its decorative lighting from a few blue lamps strung in the trees before his adjacent home to an installation approximating 130 kw. The display attracts much interest, since the establishment is located on Boston's circumferential highway route 128. The installation was designed and placed in service under the supervision of the Capron Lighting Company, Cambridge, Mass., and in the latest display 8,500 10-watt blue lamps wired in multiple are hung in several trees at the front of the property, some 44 circuits being used. The display lighting equipment is leased for special occasions and maintained by the Capron organization, which is active in theatrical work, pageantry and other illumination fields.

The outside lighting at Ruane's also includes six large floodlights and numerous 150-watt projector spots and smaller "floods" which feature cut trees marketed on ground beside the greenhouse. These were purposely cut out of service when the photograph was taken of the greenhouse and tree lighting. Fluorescent lamps have been satisfactorily used in the greenhouse interior for nearly two years, with excellent color emphasis in connection with the display of potted plants in bloom. Boston Edison service supplies the establishment for both year-round and holiday installations.

•

Infra-Red for Auto Body Repair

Many motorists are inclined to think that automobile fenders and body panels can be straightened and painted in about the same time that it took to wreck them. While infra-red lamps will not speed the repair to that point, it has certainly advanced quite a distance toward this goal and is being rapidly adopted by organizations engaged in automobile body repair and fabrication work.

A wide range of infra-red equipment is in use for this type of work as the accompanying pictures show. Experience of users is briefly summarized in the following paragraphs:

Ruedy's Auto Shop, Oklahoma City, Okla. (a). Infra-red reflector lamps 250-watt R-40 on 11½-in. centers are mounted on the end of conduit spokes radiating from a central junction box (3 in. deep, 5 in. in diameter). At the end of the spokes are 3¼-in. outlet boxes equipped with lavolier switches and sign receptacles mounted in box covers. From the lower spokes extension arms are welded to 1923 Model T Ford windshield tension clips so these arms can be rotated in a perfect circle.

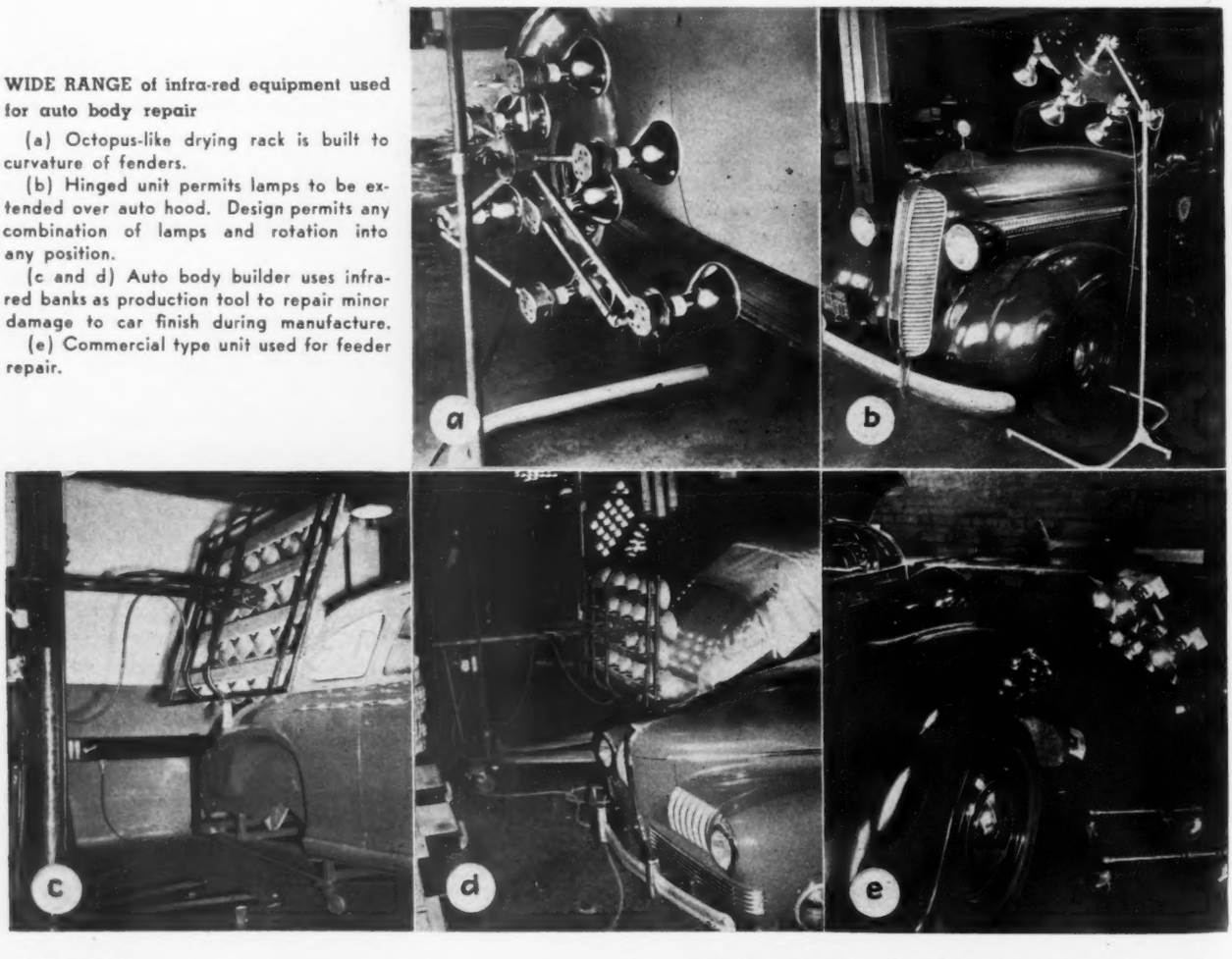
Unit is usually located approximately 24 in. from panel, or fenders. Drying time of filler coats (nine in all if necessary) is seven to nine minutes. Lacquer (two coats) 18 to 24 minutes, and synthetic enamel (two coats) 24 to 36 minutes. Total time for complete job from primer coat to finishing and polishing fender is one hour and fifteen minutes.

Oklahoma Gas & Electric Company garage, Oklahoma City, Okla., (b). Hinged type standard used so lamps may be extended over the hood of the car. Design, which also uses 250-watt R-40 lamps, permits any combination of lamps to be mounted in 3½-in. outlet boxes bolted to circular plate which is arranged so lamps can be rotated into any desired position.

Seaman Body Division, Nash-Kelvinator Corporation, Milwaukee, Wis. (c and d). Infra-red lamp banks used to repair minor scratches and damage to Nash car bodies during production. Seventeen banks of lights of three different types are in use, ranging in number of lamps from ten to 39, 260-watt lamps. Most modern is type illustrated, which has four rows of five lamps mounted in 10-in. gold-plated reflectors, rim to rim. Rows of reflectors are separated 10 in. on centers and mounted on 60 x 41-in. pipe framework. Bank can be raised or lowered, rotated about a horizontal axis, or tilted at any angle with the vertical. Banks are controlled from 30- to 60-amp. switches mounted on the standard and are plugged into heavy-duty metal-enclosed wire-way mounted around the walls close to the floor to serve these banks.

Time to dry enamel paint used on these car bodies depends to some extent on color. Average distance from panel is about 18 in. —closer for dark colors. Approximately ½ hour is required to dry a door panel.

Union Electric Company garage, St. Louis, (e). Use Nalco five-lamp "dritherm" unit. It is reported that finish can be sprayed on, lamps applied for seven minutes, and approximately 20 minutes later the surface is ready to be rubbed. Completion of a spot job is possible in half a day or less.



WIDE RANGE of infra-red equipment used for auto body repair

(a) Octopus-like drying rack is built to curvature of fenders.

(b) Hinged unit permits lamps to be extended over auto hood. Design permits any combination of lamps and rotation into any position.

(c and d) Auto body builder uses infra-red banks as production tool to repair minor damage to car finish during manufacture.

(e) Commercial type unit used for feeder repair.

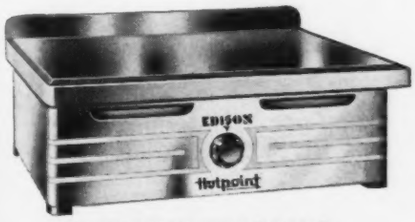
How You Can Attract More Revenue-Building Commercial Load

With the facilities you have available it is possible to increase the use of your electric service. Show your commercial prospects how they get more for their money by using your power for cooking as well as for lighting. Read how Hotpoint-Edison helps you do this.

FOUNTAIN lunches, small restaurants, coffee shops, hotels, taverns, bakeries and institutions—all of them on your Main Street lines—are ready and waiting to be sold more of the same power you already provide for lighting and motors. Hotpoint-Edison's "Brawny Lad" Electric Range and "Heat Manager" Griddle are some of the equipment which makes it possible for those customers to use profitable electricity for cooking, baking, grilling. Show your Main Street prospects how Hotpoint-Edison's faster, cleaner, electric cooking and baking turn out better food . . . attract revenue-building commercial load.

But that's only a part of the story. By starting those customers with the "Brawny Lad" Range and "Heat Manager" Griddle, you are teaching them the economy and accuracy of electric cooking. Then you have them on the road toward being 100% electric.

So don't waste a minute. Main Street load is adjacent to your existing facilities. Send the coupon TODAY for "Analysis of Profit Possibilities" on commercial cooking; also complete information about "Brawny Lad" Range and the "Heat Manager" Griddle. Edison General Electric Appliance Co., Inc., 5618 W. Taylor St., Chicago.



HOTPOINT-EDISON'S
Automatic Electric Griddle

CALROD units cast-in-iron grid bring new speed and economy to owners—build load for you. New temperature control provides increased cooking accuracy. New simplicity of construction assures long, trouble-free life. Easy to clean . . . cast-iron grids aren't harmed by scraping. Connected load, 3 KW. Fill in and send the coupon below for full information.

"BRAWNY LAD"→
Produces More Revenue Than A Dozen Domestic Ranges

BUILT to win friends—priced to get business—the "Brawny Lad" will do a man's-size cooking job in those places where domestic ranges are overworked. Big capacity in small space—only 30 inches square by 36 inches high. The custom top offers combinations of 1. Hi-Speed Calrod units, 2. Hotplates with Cast-in Calrod, or 3. Griddle tops with Cast-in Calrod. Connected load 12 KW.

For sale through leading Kitchen Equipment Houses

Hotpoint EDISON

COMMERCIAL ELECTRIC COOKING EQUIPMENT

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5618 West Taylor Street, Chicago, Ill.

Please send me information about Hotpoint-Edison's "Brawny Lad" Range and "Heat Manager" Griddle; also your "Analysis of Profit Possibilities."

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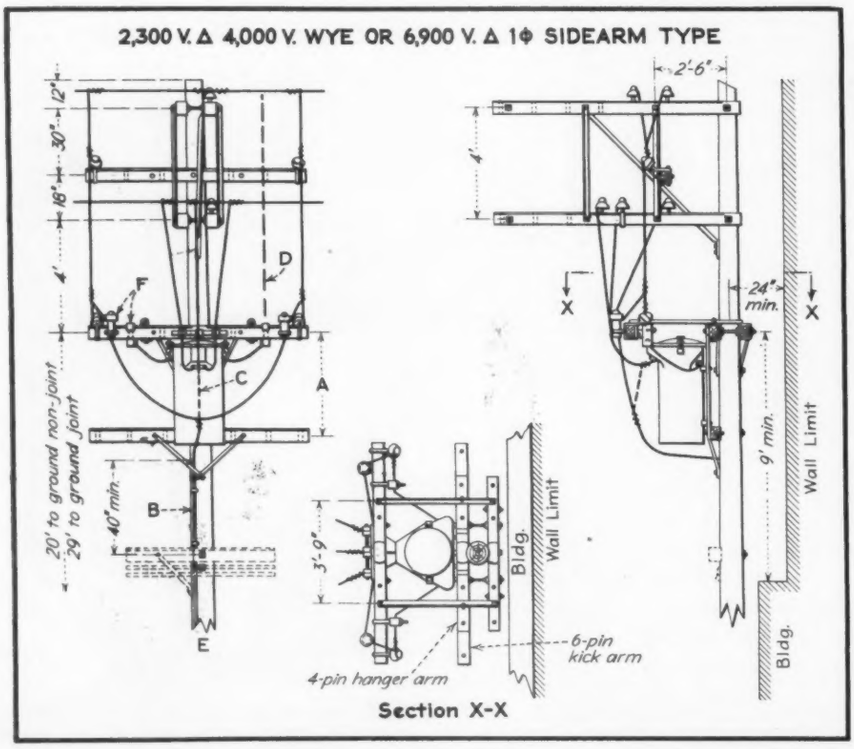
OPERATING PRACTICES

Use Outrigger Arm on Poles Close to Wall

Where conditions require transformer poles to be placed close to building walls in alleys and other congested locations distribution construction specifications of the Public Service Company of Colorado, Denver, call for the unique side-arm arrangement illustrated, which has several notable convenience and safety features.

The transformer is mounted on double arms parallel with the side of the building. Transformer accessories, lightning arresters, cutouts and secondary rack are supported from a crossarm on angle iron outriggers extending from the double 4-pin hanger arms.

Advantage of this arrangement is, obviously, that it permits transformer poles to be placed within 24 in. of buildings; much closer than would be possible if the transformer was mounted on the face of the pole. With the transformer below the secondary arm and accessories on an outrigger arm there is ample climbing space available for the lineman which is free of high-voltage wires. Cutouts are placed on the inside of the outrigger arm where they can be easily serviced by a lineman standing in the clear.



WITH TRANSFORMER on side of pole and accessories on outrigger arm, Denver company gets poles within 24 in. of walls

A Varies with size of transformer.
B 10-ft. length of molding if joint.
C Interconnect only when specified by engineering department.
D Install neutral riser in this position on 4,000-volt installations.
E Minimum height of pole—non-joints 35 ft., joint 45 ft.
F For 4,000-volt wye neutral, omit cutout and use spark gap in place of arrester. For common neutral omit spark gap also.
G Omit wood molding if interconnected.

Builds 44-Kv. Line For $900 per Mile

By PAUL P. ASHWORTH
Chief Engineer
Telluride Power Company, Richfield, Utah

A year and a half of operating experience testifies to the effectiveness of a unique design for 44-kv. transmission, 30 miles of which was constructed by the Telluride Power Company in September, 1939, for less than $900 per mile. The line is from Marysvale to Panguitch, Utah, and is designed for about 600 kva. with 10 per cent voltage regulation. It traverses a rolling-to-rugged terrain at an average elevation of 6,500 ft. and passes through some 10 miles of winding, rugged canyon.

The line is carried on 40-ft. 8-in. top "Pentrex" treated cedar poles, W.R.C.A. specifications. Configuration is 6-ft. triangular spacing with pole-top pin set in top of pole. The crossarm is $4\frac{3}{4}$ x $5\frac{3}{4}$-in. Douglas fir, 7 ft. long, not chamfered. Construction is single arm except at dead-ends and heavy angles.

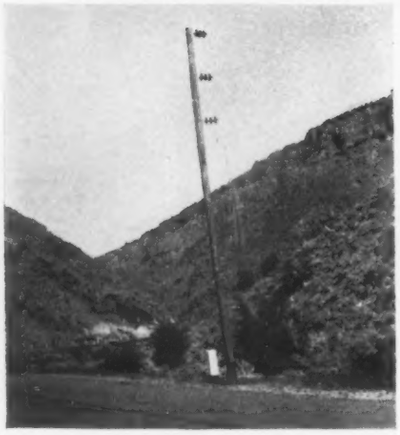
Pins are $2\frac{1}{2}$ x 6-in. paraffined locust, 17 in. over all, with $1\frac{5}{8}$-in.

No matter what type of cable you use—you can be sure of the BEST... when you specify

DELTABESTON ASBESTOS *and* *Glass-insulated* **WIRES AND CABLES**

For further information on Deltabeston Wires and Cables write to Section Y-197, General Electric Company, Appliance and Merchandise Department, Bridgeport, Conn.

GENERAL ELECTRIC



AT HEAVY ANGLES triangular configuration was abandoned for this form of construction

thread. The top pin is set in the hole bored in the top of the pole.

For ground wire No. 6 E.B.B. galvanized iron wire is wrapped three times around the top of the pole, stapled to the pole with 2-in. staples and wrapped several turns around the below-ground section of the pole with a two-turn spiral stapled to the butt end.

Armored ties, specified by the conductor manufacturer, consist of No. 8 B.W.G. soft galvanized iron wire. Tie wires are 108 in. long.

Insulators are pin-type, bullet-resistant, rated 45-kv., 125-kv. dry flashover, 85-kv. wet flashover, are $7\frac{3}{8}$ in. high, $10\frac{1}{2}$ in. maximum diameter, have 20-in. leakage distance and weigh about 25 lb.

Crossarm braces are $\frac{1}{4}$ x $1\frac{1}{4}$ in. by 28 in. long and are fastened to the crossarm by $\frac{3}{8}$ x $5\frac{1}{2}$-in. galvanized carriage bolts and to the pole by $\frac{1}{2}$ x 6-in. galvanized lag screws.

Dowel pins are of $\frac{5}{16}$-in. spiral steel, driven in $\frac{1}{4}$-in. holes. Two 8-in. dowels are driven through the pin shank at the pole top, at right angles to any pole checks. Three $4\frac{3}{4}$-in. dowels are used at each end of the crossarm, one through the pin shank and two outside.

Conductors are three No. 6 B.W.G. three-strand, 80,000-lb. galvanized steel on normal spans of 650 ft., maximum 1,015 ft.

Operating Experience

During the first months of operation there were three conductor failures, two due to conductor kinks at the time of stringing, one to the conductor's having been shot, presumably by a deer hunter. In none of these cases was there any injury or splitting of crossarms.

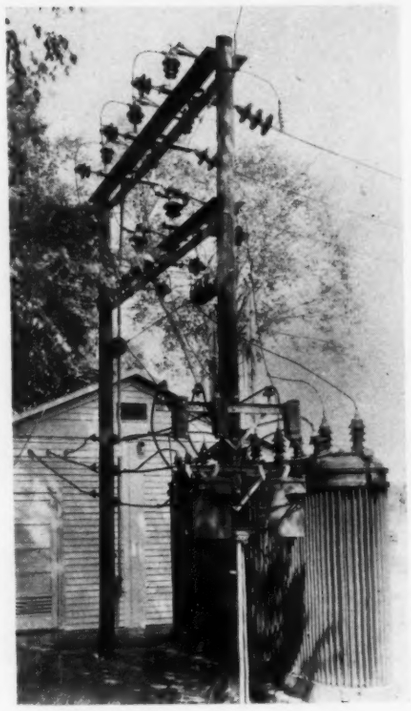
The last case is of particular interest as it shows the ruggedness of the construction. The top conductor parted about 12 ft. from the insulator and the end hung down, touching the pole intermittently, and eventually burning the pole off. The pole top, with crossarm and insulators, fell to the ground, one end of the crossarm striking first. The insulators on the crossarms stripped the pin threads, so that new pins were required, but there was no other injury of any kind to any other part of the assembly, to the conductors or to the adjacent poles.

Notwithstanding severe winter conditions, with temperatures down to minus 10 deg. F., there have been no other failures.

•

2-Pole Terminal for Outlying Substation

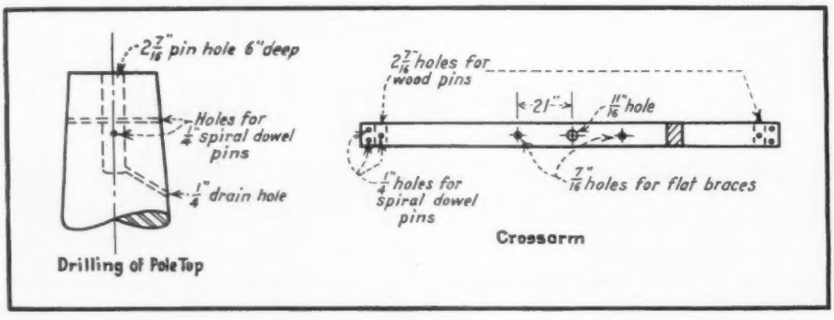
To save material and insure compactness of layout in the modernizing of a power company's substation in an outlying district the incoming 22-kv. line was dead-ended on strain insulators at a two-pole frame, disconnecting switches of the air-break type being mounted at the top on two angle-iron members bolted to the poles. High-line fuses were carried



HIGH- and low-tension structures are combined in a cross-braced pole assembly

below on pin-type insulators supported on other angles and primary taps run downward to the transformer bank well clear from the main structure.

Secondary connections and station service transformers, with 2,300-volt fused cut-outs, were supported on angle-irons carried by one pole, and short secondary cables arranged as low-voltage buses supported by strain insulators carried by the poles, with leads into the meter house beyond. Circuits for station service were carried into the building by conduit vertically away from the smaller transformers to a ground run. Clearances were found satisfactory despite the small amount of material used in the set-up.


2 7/16" pin hole 6" deep
Holes for 1/4" spiral dowel pins
1/4" drain hole
Drilling of Pole Top
2 7/16" holes for wood pins
21"
11/16" hole
1/4" holes for spiral dowel pins
7/16" holes for flat braces
Crossarm

DETAILS of pole-top and crossarm construction

•

Characteristics of Driven Ground Rods

By J. R. EATON,*
Purdue University, Lafayette, Ind.

The resistance of an electrical connection to the earth can be determined only by test. Because so many factors are involved in calculating the resistance of a ground connection under

* Consultant for James G. Biddle Company.

the wide variety of operating conditions, the equations for the calculation of resistance are useful only in so far as they indicate trends. A mathematical analysis of trends, however, based on the assumption of uniform earth resistivity, leads to the following conclusions:

1. The resistance of the earth path from a cylindrical electrode varies as the logarithm of the radius. Hence, buried ground wires or driven ground rods may be of a diameter dictated primarily by mechanical consideration.

2. The conductance of a driven ground rod increases almost in a direct relation to the depth. A group of several ground rods driven to a uniform depth will have a conductance considerably less than the sum of the conductances of the rods taken individually. The conductance of the group will approach the conductance of the sum only with very wide spacing between the rods.

3. The conductance of a deep driven rod is in general greater than the conductance of a group of short rods having the same total length, unless the spacing between the short rods is quite large.

4. The conductance of any system of electrodes spread over a given area and extending to a limited depth approaches that of a metallic box having the same depth and the same total ground surface area. This ultimate conductance is rather closely approached by a comparatively small number of ground rods driven to the same depth but rather widely spaced over the area.

The choice of the type of ground electrode system for any particular application is determined to a great extent by the local conditions. In general, if the subsoil can be penetrated and is of reasonably low resistivity the driven ground rod system will prove most economical.

[Ed. Note—This is the first of a series of short articles discussing various phases of grounding.]

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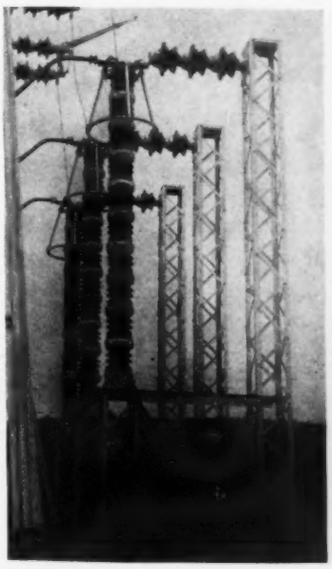
Lightning Arrester in Small Space



In an Eastern transmission company's substation where space was at some premium it was important to conserve material as much as feasible in mounting lightning arresters near the outdoor high-tension buses. In the view at left a space where the roof conditions permitted erection of a short steel framing was utilized as shown, the arresters being based on an angle-iron platform and stiffened at their tops by pin-type insulators attached to vertical latticed truss members on horizontal axes. From tubular bus extensions brought to the tops of the arresters connection was made by short taps to disconnecting switches above, leaving a short patch to ground via the arresters, as required.

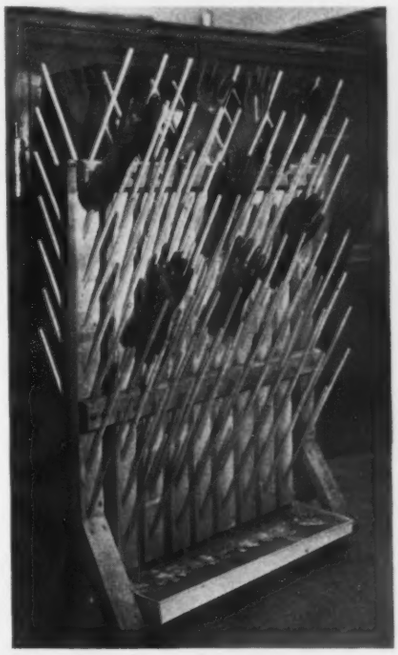
In the right-hand view the arresters were mounted directly below the high-tension tubular buses in the yard between banks of pin-type insulators carrying the buses. All were supported on a compact steel frame structure mounted on concrete piers set in the yard. Clamp type connections were made between the arrester terminals and the buses, with springing conducting strips to permit expansion and contraction. The entire structure was carried well above the ground to avoid interfering with the movements of attendants at the substation, and the absence of extended wire connections was noteworthy.

Rack and Cabinet for Tested Gloves

M. F. SMALLEY

Superintendent of Service and Meters, Ohio Power Company, Canton

Gloves which have been tested are dried on a wooden rack which has 176 half-inch dowel rods about 19 in. long set at a 30-deg. vertical angle.



After they are dry they are filed away in 7 x 16-in. manila envelopes placed on edge in a locked cabinet. The steel cabinet has space for some 300 gloves.

98% Reduction in Shutdowns

due to fuses has resulted since we installed BUSS Super-Lag FUSES

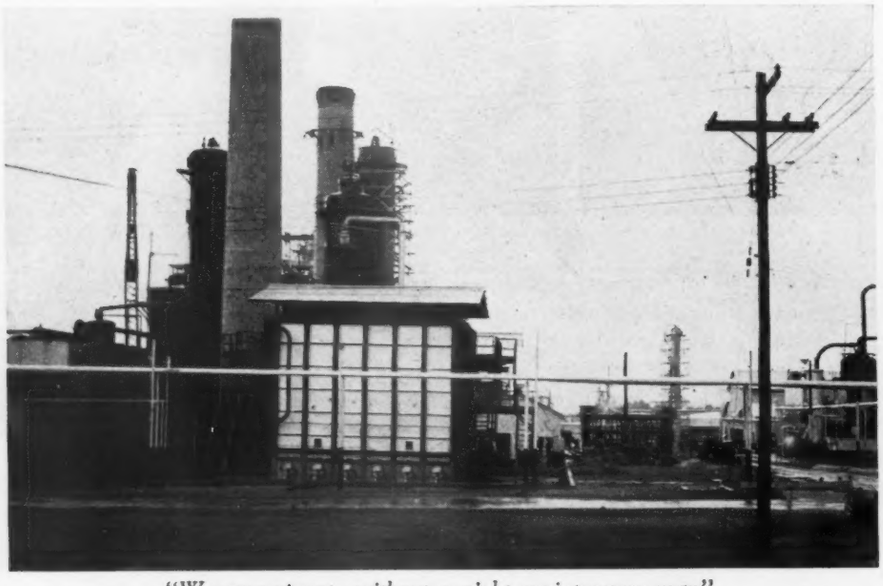
. . . says Chief Electrician Howard I. Evans, Lion Oil Refining Co., Eldorado, Ark.

"We keep a record of all shutdowns"

. . ."and," continues Mr. Evans,
"WE NOW OPERATE WITHOUT A NIGHT MAINTENANCE MAN"

"We have approximately a 2000 h. p. load consisting of about 130 motors ranging in size from 1 to 250 h. p. Most of these motors are protected by fuses.

"In order to locate sources of trouble we keep a



"We now operate without a night maintenance man"

record of all shutdowns. Several years ago we were surprised to find shutdowns were often due to poorly designed fuses blowing needlessly.

"To try to correct this condition we installed BUSS Renewable Fuses. The results were better than we had hoped for—shutdowns due to fuses dropped to about 1% of their former number—a reduction of over 98%.

"We have so little fuse trouble that we now operate without a night maintenance man—and in the past year I've been routed out of bed only about three times.

"I'll hand it to BUSS fuses, they helped us."

Anyone Interested in Plant Operation or Maintenance Can Profit by Following Mr. Evans' Lead

The experience of Mr. Evans is remarkable only in that he kept such accurate records. Thousands of other executives have, over the past many years, found that BUSS Super-Lag fuses have greatly reduced the number of useless shutdowns that formerly occurred in their plants.

There are sound reasons why BUSS Super-Lag fuses don't blow needlessly.

Fuse-Case Design Helps Prevent Shutdowns

A Renewable fuse is a contact making device—not just a container for a link. Poor contact must be prevented, otherwise excess heating will soon raise the temperature of the link and cause it to blow needlessly. Then the circuit is out and the user is penalized by a useless shutdown.

The chance of poor contact causing a BUSS fuse to open needlessly is reduced to a minimum by a patent Fuse-Case design that has resulted from years of laboratory and field tests.

When a BUSS fuse is assembled, good contact is automatically made on the link—and this good contact will remain no matter how long the fuse is in use.

Time-Lag Helps Prevent Shutdowns

Starting currents or other harmless overloads often cause ordinary fuses to open.

To guard against such blows—"lag-plates" are attached to the BUSS Super-Lag link. They give the fuse a long time-lag or retarded blowing point.

Thus, when two or more motors start at the same time or a motor starts under a heavy load or a machine jams momentarily or other such things occur that cause harmless overloads, the BUSS fuse holds instead of blowing—and the circuit is kept in operation.

How to Get Quick Results in Your Plant

If you believe that a protective device should guard against senseless interruptions of electrical service as well as against electrical hazards—just pass the word along that all stock and purchase records should be changed immediately to call for BUSS Super-Lag fuses.

If you would like more information about BUSS Super-Lag fuses to pass along to other men in your plant, ask for bulletin Rcs. It shows why BUSS Super-Lag fuses help prevent work stoppages as well as guard electrical equipment. Bussmann Mfg. Co., St. Louis, Mo., Division McGraw Electric Company.

"I'll hand it to Buss Fuses, they helped us"

BUSS SUPER LAG FUSES
WHY BUSS FUSES DON'T BLOW NEEDLESSLY
10 FEATURES in the design of the FUSE-CASE help make it possible
The SUPER-LAG development in the FUSE-LINK completes the job.

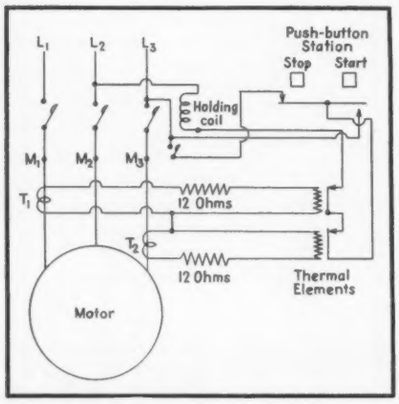
INDUSTRIAL ENGINEERING

Relay Held Closed While Motor Starts

By C. E. DIEHL
Chief Electrician
Utah-Idaho Sugar Co., Toppenish, Wash.

Ratio between primary and secondary currents in a current transformer is not constant under all conditions of operation. This characteristic was utilized to solve a problem of motor protection.

Four impact type coal pulverizers



CURRENT TRANSFORMERS hold in relay during motor starting period

were driven by 60-hp., 440-volt, 1,800-r.p.m. motors, rated 73.5 amp. running current per terminal. The starting current was 420 amp. and the starting time 65 seconds maximum. But the line start equipment provided for the motors included thermal protective relays that would operate in 20 seconds under the heavy starting current. To increase the size of the thermal elements in the relays to permit the 65-second starting time would be to have no protection for the motors while running. Some method was sought to discount the effect of the starting current without losing protection against abnormal running currents.

The current transformer supplied the answer. Two of them, 150/5 amp., were connected in the motor circuit as shown in the diagram. The thermal relay elements in the CT secondaries were so chosen in size as to give with the 30/1 ratio the same protection as afforded by the original equipment.

Then checks were made with progressively larger resistors connected in series in the secondaries to determine the size that would hold the relay closed during the motor-starting period and would not change the ratio under the normal running load. Results of the checks appear in Table I. The 12-ohm resistor was selected and another test (Table II) was made to show its performance during the starting period.

Table II shows that at 45 seconds the current transformer ratios become correct and that for all currents below 240 amp. these ratios are maintained and thus full protection to the motor up to that value is afforded. This maintains accuracy for over 30 percent of full load of the motor. With the motor and relay heaters up to a normal operating temperature, a stalled motor opens or trips the starter with full protection. However, with a cold motor and starter, insufficient protection is given if the motor fails to turn when the starter closes. With pushbutton controls at the motor, operators can open the starter manually if this occurs. No trouble has resulted from this condition.

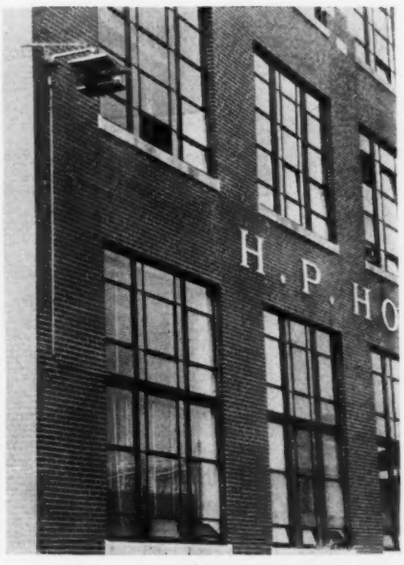
Table I—Determination of Resistor Size

Resistor Size — Ohms	Trip Time Seconds	Starting Current Secondary Amp.
0	20	14
1	20	14
2	20	14
6	22	12
8	32	11
9	45	10
10	No Trip	9.1
12	No Trip	8
18	No Trip	6.5

Table II—Performance of 12-Ohm Resistor

Time in Seconds	Motor Current, Amp.	Relay Current, Amp.	Time in Seconds	Motor Current, Amp.	Relay Current, Amp.
0	420	8	35	280	8
5	420	8	40	260	8
10	400	8	45	240	8
15	380	8	50	150	5
20	360	8	55	90	3
25	300	8	60	72	2.4
30	290	8	65	72	2.4

Sodium Lamp Serves Plant Roadway



To improve traffic conditions on a main highway passing intersecting roadways leading from its plant, H. P. Hood & Sons, Charlestown,

Here's what the users say... about the STROBOTAC

YOUR APPLICATION of the STROBOTAC may not appear in these actual comments from users . . . but there IS a STROBOTAC use for *you* if you have to observe the operation of *any* machine turning up to even as fast as 100,000 rpm or if you have use for a highly accurate electrical tachometer which requires no electrical or mechanical connection with the machine being measured. The price? Only $95.00.

Write for Bulletin 726 for Information

GENERAL RADIO COMPANY
Cambridge, Massachusetts

Mass., milk-handling establishment, recently installed a 1,000-watt sodium lamp at the corner of one of its main buildings, with control from within the structure and a ½-in. conduit feed outdoors as shown. Mounted on a swiveled supporting bracket of 1x¼-in. bar iron, the lamp and reflector are located about 30 ft. above the street level, and protect the approaches for a distance of about 75 ft. on either side, as well as across the main thoroughfare. The cost of the job was about $60 and a life of 2,000 hours is obtained from the lamp proper.

This industrial application of the sodium lamp is somewhat out of the ordinary and solved the local problem effectively, since it was not feasible to locate a traffic beacon in the roadway opposite the building at the intersection of the busy highways involved in handling motor and truck traffic associated with the plant as well as unconnected with it.

•

Series Capacitor Cuts Welder Demand

By L. G. LEVOY, Jr.
Industrial Engineering Department, General Electric Co., Schenectady, N. Y.

In a recent application of series capacitors to resistance welding (see ELECTRICAL WORLD, May 3, 1941, p. 64), a single capacitor bank was utilized to correct power factor for a range of welder throat positions. This was done by selecting a compromise capacitor providing correction to approximately unity power factor with the throat in its central position and permitting the power factor to deviate slightly from unity as the throat position was changed.

The particular application here described required widely different throat positions because of the shape and dimensions of the structures to be welded. These consisted of large frameworks for switchboards, inclosing cases and similar items. Materials ranged from aluminum to structural steel, with thickness ranging from two pieces of ¼-in. metal to lighter gages. The extension of the resistance welding process to the fabrication of these structures was especially desirable because of the increased production rate it would permit.

In the deep throat position it was estimated that this machine would have a single-phase intermittent, low power factor demand of about 2,500 kva. at 32 percent lagging power factor. Existing feeders and substation were incapable of supplying any such demand without exceeding the allowable voltage drop. In addition, several other welding machines in the same building would be subjected to severe interference if such a load were imposed on the feeders.

Further studies indicated that power-factor correction could reduce the demand from 2,500 kva. at 32 percent lagging power factor to 800 kva. at unity pf., which would be satisfactory on the existing substation. The welding machine demand was so large, however, that it was desirable to maintain close power-factor correction in both extreme throat positions.

In order to accomplish this without switching the capacitor the welding transformer was designed with suitable taps and series parallel windings so that its turn ratio could be adjusted to reflect the same reactance in the primary for both secondary throat positions and at the same time provide adequate current for welding. Control of the welding current was accomplished by phase control in the thyratron circuit, and consequently no tap changing is required for different kinds of work, except when changes of throat are made on the welding machine.

Before this method was adopted to solve the power supply problem other possible alternatives were considered, including the building of a new substation or the installation of a suitable motor-generator set to supply this load. Cost comparisons of these three possibilities showed:

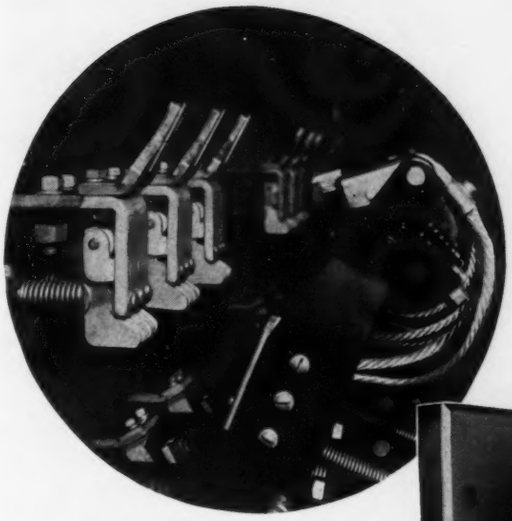
	Series Capacitor	New Substation	M/G Set
	Percent		
Series capacitor	24.3	0	0
Control and tubes	9.6	9.6	9.6
Cable, circuit breakers and installation	20.7		
Welding machine (including transformer)	45.4	45.4	45.4
New substation and installation		103.0	
Motor-generator set and installation			172
Total costs	100	158	227

In view of the marked advantages of the series capacitor installation, both from economic and operating standpoints, it was adopted. The capacitor inclosure also contains automatic protective equipment, including overvoltage protection and capacitor discharge relays for removing all charge when the circuit is de-energized.

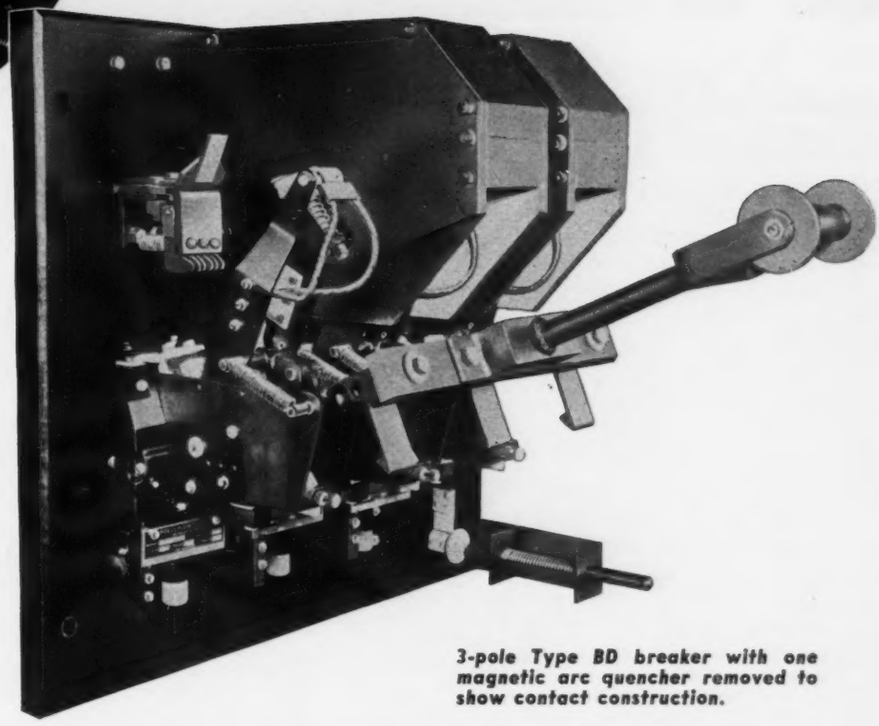
[ED. NOTE—*A discussion by the author of the general application of series capacitors to resistance welding is included in the A.I.E.E. Transactions Supplement, December, 1940.*]

Concentric cable provides independent feeder from substation to welding machine, has air circuit breaker protection at each end. Capacitor bank, made up of 75 units supplying 2,370 kva. (intermittent rating) and completely inclosed in a dust-proof steel cubicle, was mounted on platform above thyratron control and welder to save floor space. Throat transfer switch, interlocked with main power circuit, reconnects and selects proper tap on welding transformer primary when throat is changed from either deep or shallow position.

SINGLE series capacitor bank corrects power factor for two widely different throat positions, cuts resistance welder demand of 2,500 kva. to line demand of 800 kva.



FINGERS That Never Get Burned



3-pole Type BD breaker with one magnetic arc quencher removed to show contact construction.

Examine the contact structure of a Roller-Smith Type BD air circuit breaker and you'll see how the main contact fingers are protected against burning.

Notice how they maintain their pressure until the point where separation is intended to occur. See how the main contacts always separate first on opening . . . and make last on closing. Therefore, all of the arcing takes place on the arcing tips and easily replaced arcing horns. Note, too, the wiping action . . . the free-floating construction of the high pressure fingers.

Above all, check that inverted design of all contacts. This arrangement, exclusive with Roller-Smith, produces a current loop in which the electro-magnetic force, during short circuits, helps maintain the contact pressure. Thus, there is no possibility of Roller-Smith air breakers being blown open.

Complete information is contained in Catalog 5, Section 3. Get your copy today from our nearest representative or write Roller-Smith, Bethlehem, Pennsylvania.

ROLLER SMITH

Electrical Measuring and Protective Apparatus

ROLLER-SMITH COMPANY BETHLEHEM, PENNA.

Switchboards • Metal Enclosed Switchgear • Electrical Instruments
Indoor and Outdoor Oil Circuit Breakers • Air Circuit Breakers

NEW ENGINEERING IDEAS

Reactance Formulas for Stranded Steel

By THOMAS JAMES HIGGINS
Purdue University

The present activity in rural electrification has resulted in an intensive use of triple-stranded steel wire for lines serving farm loads. The electrical design of such lines is complicated by the fact that the inductive reactance varies not only with the spacing and size of conductor employed, but also with the magnitude of the line current and the metallurgical nature of the wire itself, factors not encountered when copper conductors are used. Inductive reactance tables are furnished by manufacturers to customers, but these often require interpolation.

The illustration shows the flux lines produced by one strand of the left-hand conductor. In the immediate neighborhood of the adjacent strands the flux lines would be slightly distorted from the circular shape shown by the steel. Mathematical investigation has proved this to be negligible and the line can be considered as true circles. The total inductance is

$$(1)\ L = \mu\left(\frac{1}{6} + 2\log_e 3 - \frac{4}{3}\log_e 2\right) + 2\log_e \frac{(D^{14}D^{15}D^{16}D^{24}D^{25}D^{26}D^{34}D^{35}D^{36})}{3r}\ \frac{1}{9}$$

where the first term of the right-hand side is the contribution of the flux cutting the left-hand conductor, the second term is due to the remaining effective flux, and μ is a fictitious permeability that depends on the geometry of the conductor cross-section, the magnitude of the current, and the metallurgical nature of the conductor itself.

Formula (1) may be written.

$$(2)\ L = 1.4397\ \mu + 2\log_e \frac{D}{3r}\ \text{abhenries/cm. of conductor length}$$

or

$$(3)\ L = 0.232\ \mu + 0.322\log_i \frac{D}{3r}\ \text{mil-henries/mile of conductor length.}$$

The sixty-cycle reactance is obtained by multiplying (3) by $120\pi/1{,}000$.

Therefore

$$(4)\ X = 0.0874\ \mu + 0.1214\log_e \frac{D}{3r}\ \text{ohms/mile of conductor length.}$$

When μ, constant depending on load current and type of conductor, is known the reactance can be computed from (4) for any spacing. To determine it by measurement a test loop is strung, the desired current passed through the loop, and the total loop inductance measured on a bridge. The spacing and strand radius being known, the term $(0.322\log_e \frac{D}{3r})$ is computed and subtracted from the measured value, allowance having been made for the short sides of the rectangular loop. The subtrahend is 0.232μ. Knowing μ, the reactance at any spacing can be computed from (4).

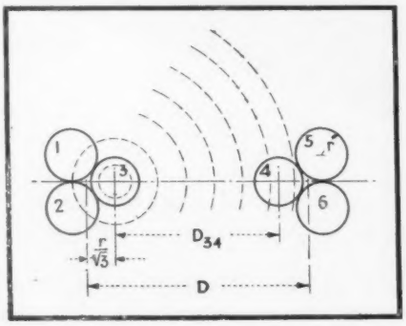


DIAGRAM shows the flux lines produced by one strand of the left-hand conductor

On the other hand, if the reactance is known for any spacing, the term $(0.1214\log_e \frac{D}{3r})$ can be subtracted, giving 0.0874μ. This constant being known, the reactance can be computed for any other spacing.

Equation (4) may be written

$$(5)\ X = 0.0874\ \mu - 0.1214\log_e 3r + 0.1214\log_e D = K + 0.1214\log_e D\ \text{ohms/mile of conductor length}$$

where K is a constant for a given conductor and current. If K is given, determined or just indicated, then add $0.1214\log_e D$ to obtain X for any spacing (measured in the same unit as in computing K.).

Equation (5) can be used for any type of conductor with symmetrical cross-section, whether stranded steel, aluminum with steel core, or otherwise, provided that D is not too small. K could be supplied in the tables of reactance furnished by manufacturers of the steel cable, thus eliminating the necessity of interpolating tables.

•

A New Treatment for Cedar Poles

To control sapwood decay, especially the form known as "shell rot" in standing poles, a new treatment for cedar poles has been developed, which involves the application of a new wood-preserving chemical, a highly chlorinated phenol known as "pentachlorophenol." The treatment is designed for the above-ground portion of poles and is a supplement to the regular butt treatment, thereby bringing the durability of the pole tops in line with that of the pole butts.

Sound Engineering
Finest Materials
Efficient Production
Careful Testing

This is why every L-M transformer is a good buy!

LEFT—UP SIDE DOWN TEST ABOVE—CONVEYOR LINE ASSEMBLY

Each year, every customer-preference survey shows that transformers bearing the name "Line Material" are closer to the top of the list.

The definite reasons for this are: Sound engineering, fine materials, efficient production, careful testing — all the factors of design and manufacture to be found in a modern transformer plant . . . These factors make every L-M Distribution Transformer a good buy, regardless of size, capacity, or type.

The illustrations above tell their own story. In addition to the production methods shown here, there are automatic welders for the tanks, infra-red drying ovens for the paint — ample modern facilities which enable us to build transformers as you want them, built to meet your service requirements.

LINE MATERIAL COMPANY

The chemical which is a dry crystalline substance, has a low vapor pressure (at 68 deg. F., 0.00017 m.m. of mercury) and a low degree of volatility. Its solubility in water is only 5 parts in 1,000,000 at 35 deg. F. and up to 35 parts in 1,000,000 at 90 deg. F.; this low solubility resists leaching. It is, however, sufficient for high toxicity; a solution of 0.002 percent causes total inhibition of, and a concentration of 0.004 percent causes death to fungus responsible for most of the sapwood decay in standing cedar poles.

The pole treating solution consists of the chlorinated phenol and a light petroleum oil which is both the solvent and the vehicle or carrier.

For the treatment, the completely manufactured poles are immersed full length in the treating solution. Neither heat nor pressure is used. After a predetermined time, the poles are removed from the immersion tank. Then follows the regular and long established incised-process creosote butt-treatment.

The immersion treatment is designed for a solution absorption to a full ½-in. depth and to deposit in the sapwood ¼-lb. of dry chemical per cubic foot of sapwood. Absorbed solution evaporates in a relatively short time.

•

Faster Testing With Socket Meter Kit

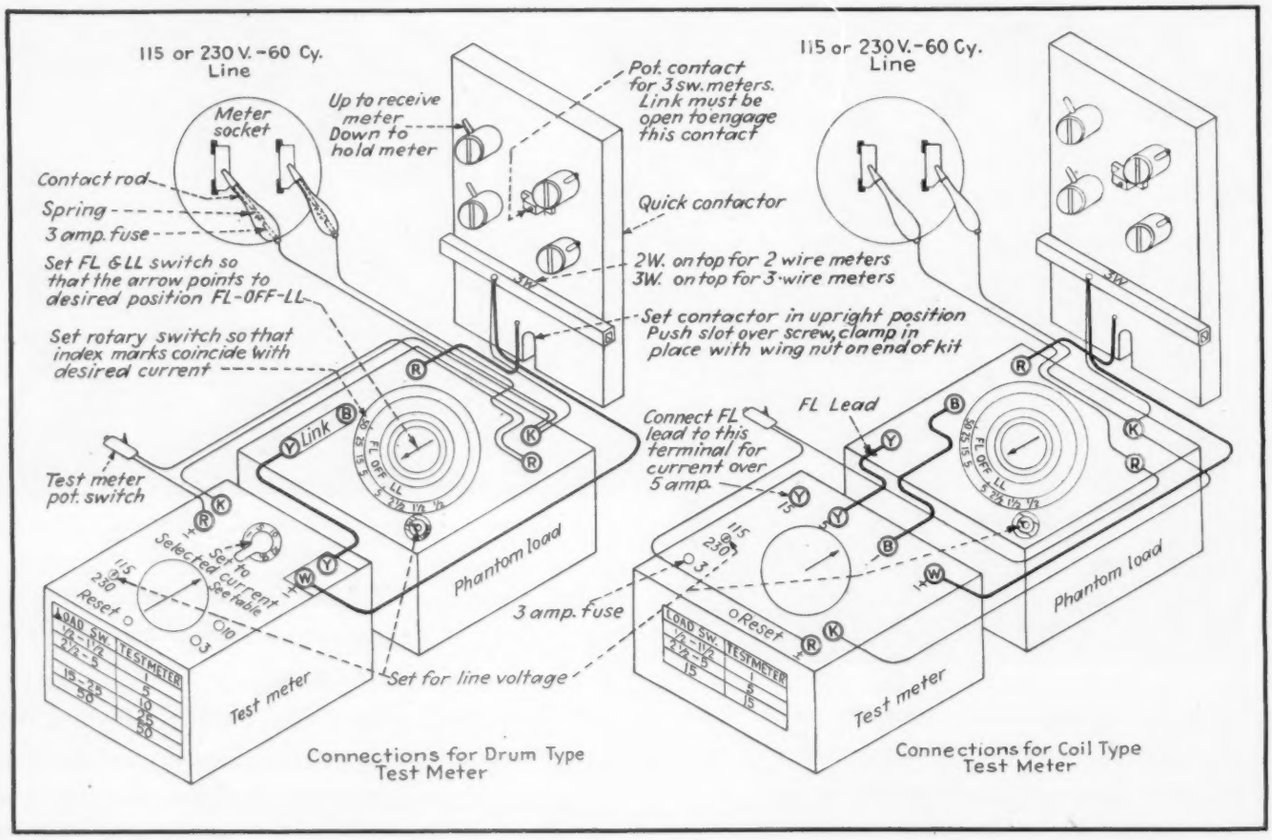
To meet the requirements for routine testing of the type "S" meter, this test kit was designed to have a minimum of connections for time-saving, to be used by testers with a limited amount of instruction and to by-pass the customer's load as soon as kit connections are made to the meter socket receptacles. With this equipment 115-volt, two-wire and 230-volt, two- and three-wire meters may be tested.

Of particular interest in this kit are the two-wire, three-wire changeover device, a "quick contactor" for "S" meters and the terminal connectors for connecting the kit to the jaws of the socket receptacle, which are fused to protect the equipment. Phantom load, standard meter and quick contactor are all permanently connected inside the kit. To use it the tester simply removes the meter from its socket receptacles and places it on the quick contactor and then lifts a two-conductor cable from the kit and connects it to the jaws of the receptacle.

Jaws of the quick contactor are designed to aid preparing the meter for test; four lever-actuated cams both hold the meter in position during test and supply the necessary connections to meter for test. Levers are flipped into the upper position, the meter is inserted and the levers then pulled downward.

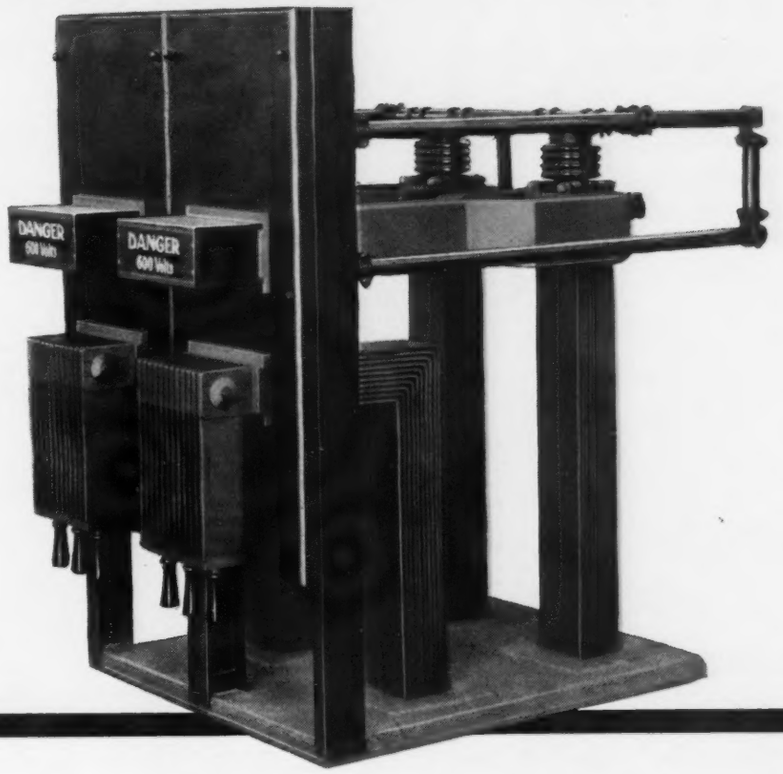
The phantom load is equipped with a full-load light-load switch so designed that when the full-load value is set up by the rotary load switch the light-load value equal to 10 per cent of full-load current is automatically set simultaneously. Thereafter, as long as he is testing the same size meter, he need only turn the knob of the full-load light-load switch to either value desired.

Designated as type "KFLD" test kit, the equipment is a product of the States Company, Hartford, Conn.


115 or 230 V.-60 Cy. Line
Meter socket
Up to receive meter Down to hold meter
Pot. contact for 3 sw. meters. Link must be open to engage this contact
Contact rod
Spring
3 amp. fuse
Quick contactor
2W. on top for 2 wire meters
3W. on top for 3-wire meters
Set FL & LL switch so that the arrow points to desired position FL-OFF-LL
Set contactor in upright position Push slot over screw, clamp in place with wing nut on end of kit
Set rotary switch so that index marks coincide with desired current
Link
Test meter pot. switch
Set to Selected current See table
Reset
Phantom load
Test meter
Set for line voltage
Connections for Drum Type Test Meter
115 or 230 V.-60 Cy. Line
FL Lead
Connect FL lead to this terminal for current over 5 amp.
3 amp. fuse
Connections for Coil Type Test Meter

METER TEST KIT includes rotating standard, phantom load of all required ranges to conform to state testing codes, test jack that allows changeover from three-wire to two-wire test with two motions and without use of screwdriver, start-and-stop switch, completely connected leads, carrying case and instructions. Cover of kit contains diagram of connections for drum- and coil-type meters (left) and disk revolution table

POWER THROUGH COPPER!



Anaconda Shapes for every kind of bus conductor... engineered for highest efficiency

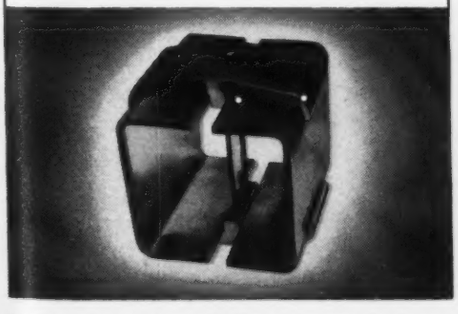
Because of its high conductivity and consequent low current losses, copper has always been the most widely used material for bus conductors. To these advantages may be added such further qualifications as high thermal conductivity, high strength, high resistance to corrosion and ready availability of accessory equipment. Thus it is that copper lends itself to more efficient bus constructions.

Wherever modern electrical engineering practice dictates bus construction embodying structural strength, low ohmic and reactance losses or effective heat dissipation, the range of copper bus shapes made by The American Brass Company will meet every requirement.

The complete line includes flat bars, tubes, cables, and angles and channels for ventilated structures. Descriptive literature and advice of our technical staff are available on request. 41128

SELF-VENTILATED BUSSES

In addition to the many natural advantages of Anaconda Copper for busses, namely: High conductivity, strength and low coefficient of expansion, The American Brass Company has developed additional advantages through the design of hollow self-ventilated busses, the construction being an assembly of channels, angles, or rectangular shapes.



ANACONDA
from mine to consumer

Anaconda Copper

THE AMERICAN BRASS COMPANY, General Offices: Waterbury, Conn.
Subsidiary of Anaconda Copper Mining Company
In Canada: ANACONDA AMERICAN BRASS LTD., New Toronto, Ontario

NEW EQUIPMENT

Aerial Ladder

Ladder of welded steel construction and mounted on steel turntable has platform that is parallel with the truck bed. Lever-operated hydraulic pump elevates stairway hoist to any desired height, and at full extension the lineman is enabled to reach points 21 ft. above ground. Steps and platform are covered with corrugated rubber matting.

L-M Piersch aerial ladder. **Line Material Co.**, Milwaukee, Wis.

•

Industrial Multi-Breaker

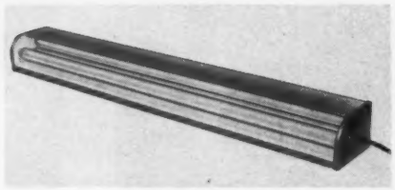
Inclosed industrial multi-breaker; sizes M-1, 50 amp. max., M-2, 100 amp. max.; two- and three-pole, 230 volts a.c. **Trumbull Electric Mfg. Co.**, Plainville, Conn.

Line of multi-breakers is extended to industrial field. They are arranged for surface mounting and equipped with non-tamperable units, with both thermal and magnetic trip which provides time delay on small overloads and instantaneous operation on short circuits and high overloads. Tripping is indicated through a target in the front cover. Operation is trip free, cannot be held closed against short circuits.

•

Fluorescent Unit

Designed for display lighting, the portable unit has a "stepped" reflector. Light from the lamps is thrown back against the



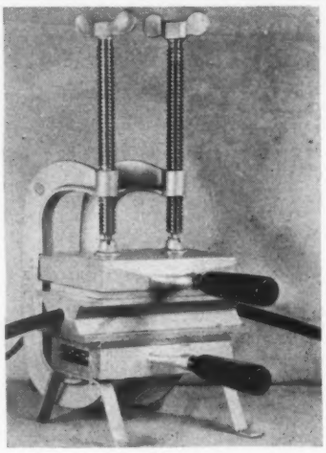
"Miralume D-100" fluorescent unit, utilizes two 40-watt lamps. **Hygrade Sylvania Corp.**, Salem, Mass.

display material and up through a lenticulated glass panel. On floor of a display window or in a showcase it has the general effect of a theatre footlight.

•

Industrial Vulcanizer

Vulcanizing equipment has interchangeable mold blocks to handle single- or multiple-conductor cables, for use in replacing rubber insulation covering where cables are spliced or where insulation has become damaged. Dual thermostatic control provides temperature regulation.



Vulcanizer; for cable sizes up to and including 2 in. O.D.; rated 600 watts, 115 volts a.c. **The Shaler Company**, Waupun, Wis.

BUYING ELECTRICAL EQUIPMENT?—McGraw-Hill's *Electrical Buyers Reference* is a convenient place to look first for manufacturers' product data, names and addresses.

Blackout Light

Designed for installation in areas vulnerable to extensive aerial bombardment and to permit movement of ground traffic without observation from the air, the luminaire has a shielding type reflector shaped like an "admiral's hat," preventing upward light. It produces about one candlepower of light with an Argon lamp. Invisible light (ultra-violet) rays can be made visible by use of fluorescent paints on posts and signs, to help direct traffic.

"Blackout" luminaire, with 2½-watt Argon lamp. **General Electric Co.**, Schenectady, N. Y.

•

Degasifier

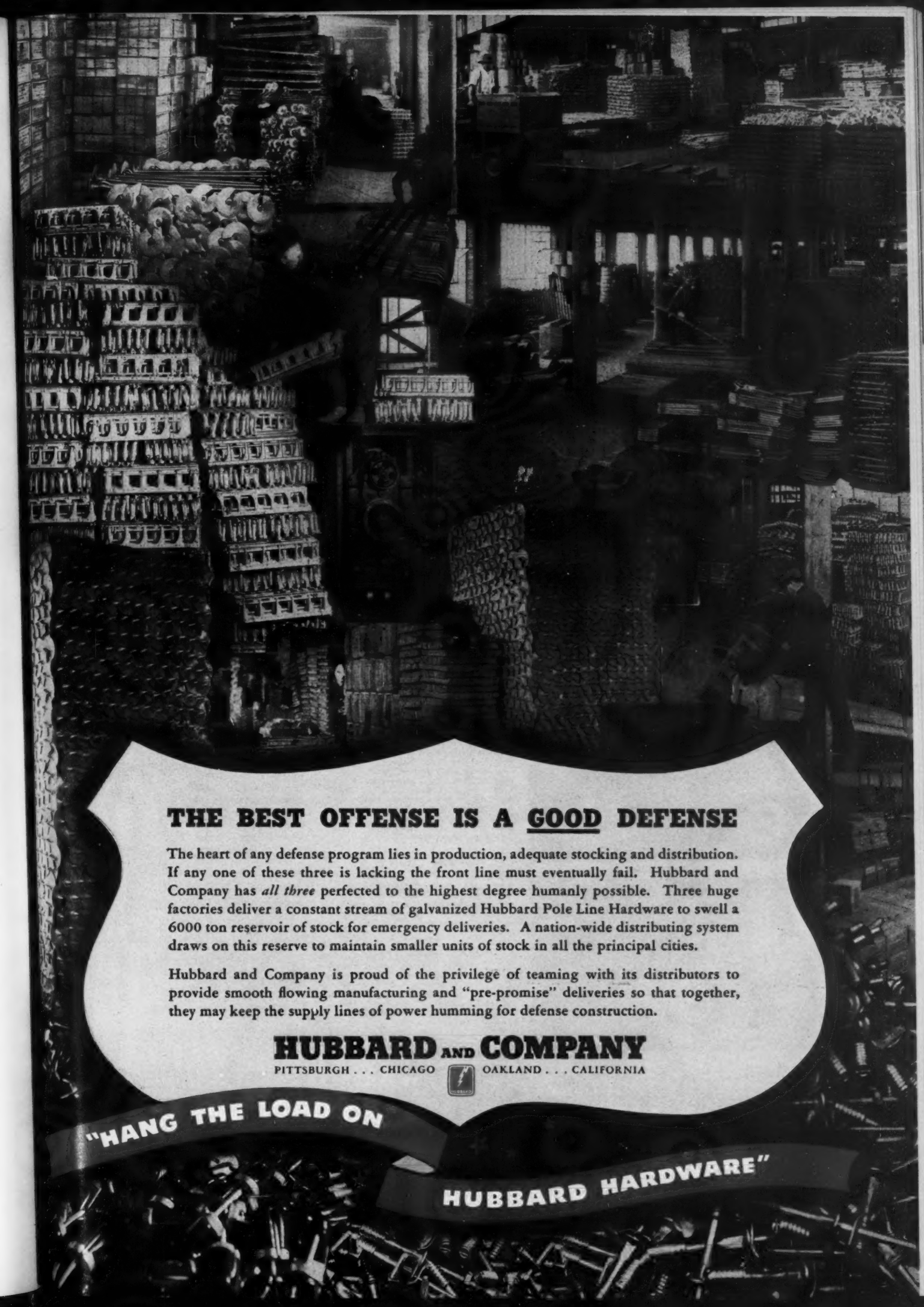
Steam sample degasifier. **Cochrane Corporation**, Philadelphia, Pa.

Designed for the collection of hydrogen samples from boiler water, the degasifier can be used with a 1,350-psi. boiler and to sample steam from several sources. Steam sample is first condensed and then degasified by atomization. Non-condensible gases are vented from a vent condenser for analysis.

•

Registration Control

Unit for inspection and registration control is designed for controlling or inspecting cutting and printing operations on cellophane, paper, cloth, tin and metal foil. It observes registration marks from penetration of light through transparent and translucent materials, as well as reflection



THE BEST OFFENSE IS A GOOD DEFENSE

The heart of any defense program lies in production, adequate stocking and distribution. If any one of these three is lacking the front line must eventually fail. Hubbard and Company has *all three* perfected to the highest degree humanly possible. Three huge factories deliver a constant stream of galvanized Hubbard Pole Line Hardware to swell a 6000 ton reservoir of stock for emergency deliveries. A nation-wide distributing system draws on this reserve to maintain smaller units of stock in all the principal cities.

Hubbard and Company is proud of the privilege of teaming with its distributors to provide smooth flowing manufacturing and "pre-promise" deliveries so that together, they may keep the supply lines of power humming for defense construction.

HUBBARD AND COMPANY

PITTSBURGH . . . CHICAGO OAKLAND . . . CALIFORNIA

"HANG THE LOAD ON HUBBARD HARDWARE"

You Can Safely Specify

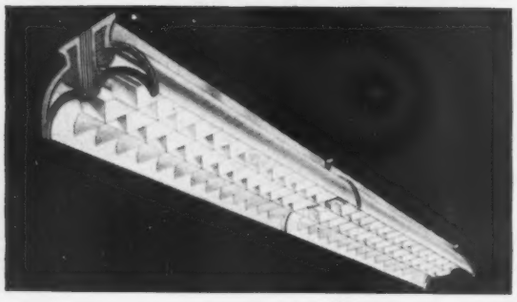
Guth FLUORESCENT LIGHTING

The Line Backed by 39 Years of Successful Experience

When your customers want information and recommendations on Fluorescent Lighting, give them the facts about GUTH Fluorescent. These quality Luminaires are engineered to deliver more light and better light, right where it's wanted; and they're built to uphold our 39-year reputation for quality! You win new friends and new prestige every time you specify GUTH Fluorescent.

Built STRONGER To Serve LONGER!

GUTH Fluorescent is built ruggedly, has carefully tested High Power Factor accessories, and engineered permanent Reflectors. Inspection by the Underwriters' Laboratories, Inc., and frequent factory checkups assure the highest quality at the lowest cost. Your specification of GUTH Fluorescent assures your customer "The Best Fluorescent Buy"!



GUTH Excelux

Trim, modern design for office and store lighting. Semi-Direct illumination. Full-screen lamp diffusion effected with either glass or plastic shield. Made for 4-40 or 6-40 watt Fluorescent Lamps.

GUTH Surface Troffer

May be installed as individual units or in continuous runs. Made for either 2 or 3 40-watt lamps per 48" section. Egg-crate Louvres provide 45° lamp shielding. "Add-on" Filament and GERMICIDAL LAMP sections are available.

Important Data for Utility Men

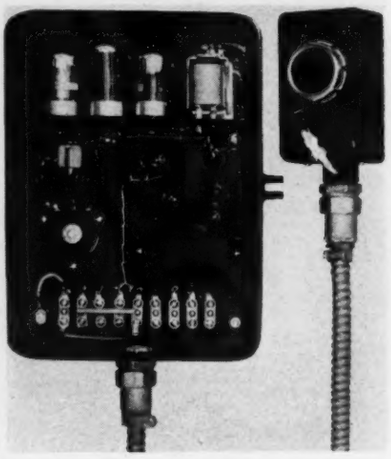
New GUTH Specification Sheets are just off the press — ready to help you figure a Fluorescent Job and show the prospect exactly what he is getting. Write today for complete set.

The EDWIN F. GUTH COMPANY 2615 Washington Ave. St. Louis, Mo.

Guth

"LEADERS IN LIGHTING SINCE 1902"

from opaque materials. An impulse of as short a duration as 0.001 second will be detected and converted into a controlling operation.



Type "A80" photoelectric inspection and registration control. **Photoswitch, Incorporated,** Cambridge, Mass.

•

Megohmmeter

Model "B-5" megohmer; range, 0-200 megohms for insulation tests, 0-2,000 ohms for low resistance measurements; d.c. voltmeter scales 0-300 and 0-600 volts. **Herman H. Sticht Co., Inc.,** 27 Park Place, New York, N. Y.

A self-contained insulation resistance testing instrument operates from two No. 6 dry cell batteries. It has a steady test voltage of 500 volts d.c. and a triple-color grading scale which classifies insulation as good, fair and doubtful.

•

Cable Dead-End

Thick-walled cable socket is indented on the cable. A permanently secure grip on conductor is said to be obtained. Various types of clevis arrangements can be supplied to meet specific requirements.

Type "YE" dead end; cable sizes from No. 8 to 2,000,000 cir.mil. **Burndy Engineering Co. Inc.,** 459 East 133d St., New York, N. Y.

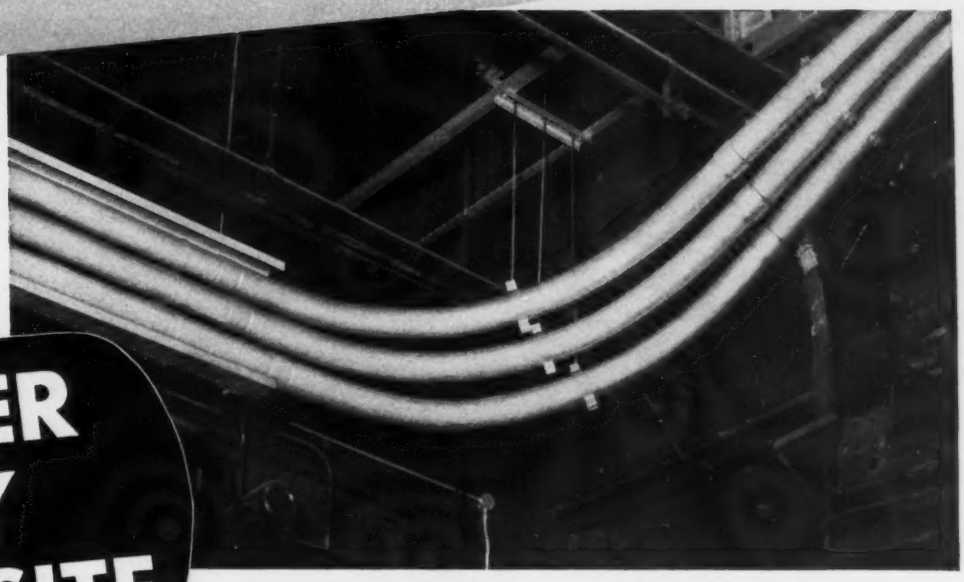
•

Service Centers

Service Centers; 2-, 4- and 6-circuit. **Heineman Electric Co.,** Trenton, N. J.

A line of service centers for branch circuit protection have "Magnette" non-thermal type circuit breakers, which combine magnetic inverse time delay on overloads with magnetic instantaneous trip on short circuits.

Looking for a duct that controls induction losses?



BETTER TRY TRANSITE

On single-phase alternating-current lines, the asbestos-cement composition of Transite Ducts reduces induction losses to a minimum.

INDUCTION LOSSES are practically zero when you use J-M Transite Ducts. This means that these asbestos-cement cableways are ideal for carrying single-phase alternating-current lines. And whether used above ground, below ground or on exposed locations, Transite Ducts provide these additional advantages:

Low Installation Costs: Light in weight, easy to handle and assemble, Transite Ducts save time on any job. Underground, Transite *Conduit's* strength eliminates the expense of a concrete casing. Where a casing is required, thinner walled, lower priced Transite *Korduct* is recommended. Its long lengths require fewer joints, spacers and supports. And both Transite *Conduit* and Transite *Korduct* have a smooth bore that assures easy cable pulls at all times.

No Fire Hazard: Made of asbestos and cement, Transite Ducts cannot burn. On multiple-duct, concrete-encased systems, Transite *Korduct* provides the equivalent of extra fire-protection between cables without extra cost. And neither Transite *Korduct* nor Transite *Conduit* will contribute to the formation of combustible fumes or gases.

Low Maintenance Costs: Being non-metallic and inorganic, Transite Ducts won't rust or rot. On exposed locations, Transite Conduit effectively resists weather, smoke and fumes. Underground, it offers unusual resistance to corrosive soils . . . holds its strength and true form under sustained earth loads and traffic pressure.

• • •

For full details on both Transite Conduit and Transite Korduct, write for brochure DS-410. Johns-Manville, 22 East 40th Street, New York, N. Y.

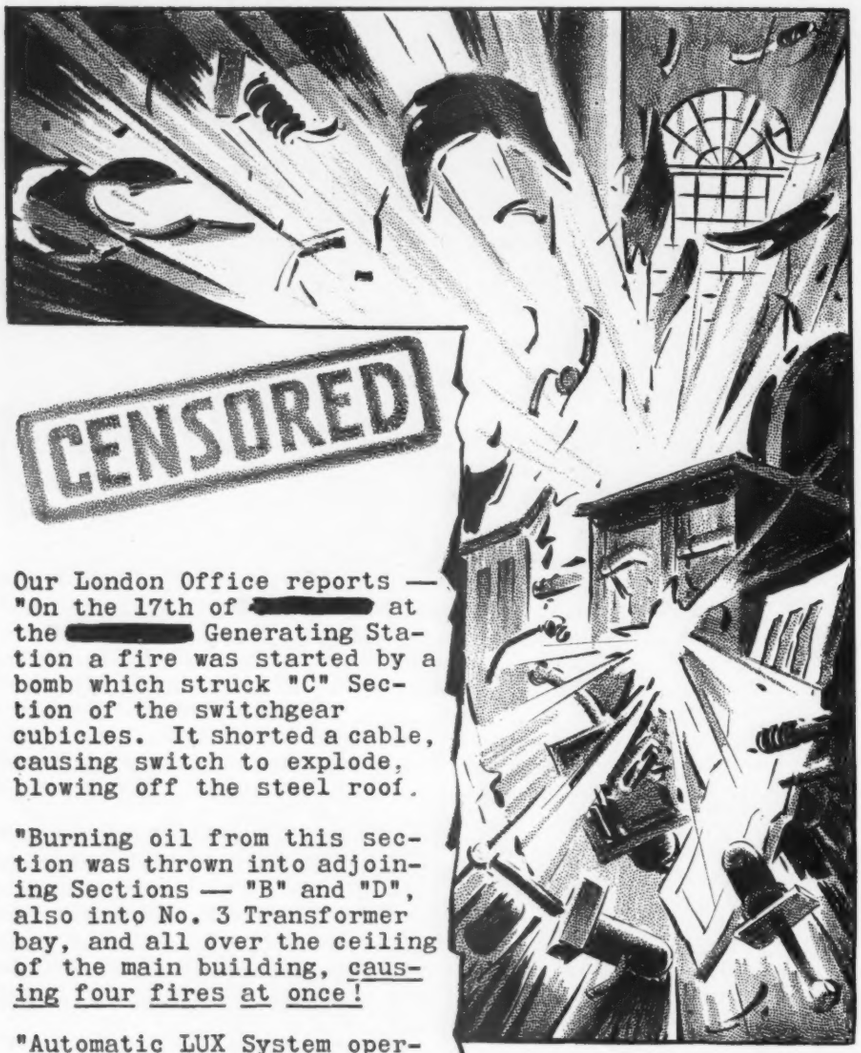
JM Johns-Manville TRANSITE DUCTS

***Transite Conduit*—for exposed work and for installation underground without concrete encasement.**

***Transite Korduct*—for installation in concrete. Thinner walled, lower priced, but otherwise identical with Transite Conduit.**

ON THE NIGHT OF THE 17TH A BOMB STRUCK THE SWITCHGEAR CUBICLE

[A REPORT FROM ENGLAND]



Our London Office reports — "On the 17th of [redacted] at the [redacted] Generating Station a fire was started by a bomb which struck "C" Section of the switchgear cubicles. It shorted a cable, causing switch to explode, blowing off the steel roof.

"Burning oil from this section was thrown into adjoining Sections — "B" and "D", also into No. 3 Transformer bay, and all over the ceiling of the main building, causing four fires at once!

"Automatic LUX System operated in these four sections, opening the valves and releasing the fourteen 50-lb. carbon dioxide cylinders. In 3 or 4 minutes all four fires were extinguished.

"The ceiling still blazed. A LUX Wheeled Unit was rushed up and the operator snuffed out the remaining fire."

The point is simply this.—The [redacted] Generating Station was ready when an emergency struck it. A LUX installation, made in peacetime, played its part brilliantly in time of war! Prepare with LUX Built-in Extinguishing Systems and LUX portables. Then you're ready for fire—whenever it strikes!

Walter Kidde & Company
INCORPORATED
728 West Street, Bloomfield, N. J.

Magnetic Separator

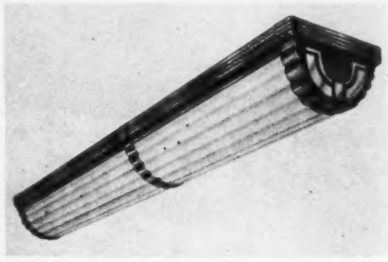
Model "PQ-4" Permanent Magnet Ferro-Filter; capacity, 40 g.p.m. of lubricating oil. **S. G. Frantz Co., Inc.**, 161 Grand St., New York, N. Y.

An addition to the line, the ferrofilter has a larger capacity, to remove fine iron and steel particles from circulating lubricating oil systems. It has a 1½-in. pipe connection.

•

Fluorescent Fixture

Designed for direct ceiling mounting, the fixture has fluted glass cylinders in 2-ft. lengths. It is available in units 2, 4, 6 and 8 ft. long, also continuous, and for two and three 20-, 30- and 40-watt fluorescent lamps in parallel.



"Kingsway" fluorescent fixture. **Day-Brite Lighting, Inc.**, St. Louis, Mo.

•

Terminal Strips

"Series 150" terminal strips: two to ten terminals; three sizes, fits 50, 70 and 90-amp. solder lugs for 6-, 4- and 2-gauge stranded wire. **Howard B. Jones**, 2300 Wabansia Ave., Chicago, Ill.

New line of terminal strips have body of molded Bakelite, with barriers between each set of terminals, following around the edge of the strip and terminating with the base, prevent direct shorts from frayed wires at the terminals. Mounting holes are at ends of strip.

•

Electric Stopwatch

Synchronous motor operates a direct reading indicating counter. Stopwatch integrates to 1,000 minutes, reading in full minutes and hundredths of a minute. It can be reset to zero from any reading, or successive readings can be totalled.

Model "Time-It" electric stopwatch, 115 volts, a.c. **The Precision Scientific Co.**, 1750 N. Springfield Ave., Chicago, Ill.

But true to mining traditions TIREX is on hand to insure safe, dependable operation of the loaders and of the motors. TIREX has established such an enviable reputation for its dependability and safety in operation that wherever mechanized mining is employed TIREX is generally the portable cord or cable in use.

In this particular mine the Union Potash & Chemical Co. of Carlsbad, New Mexico are mining potash . . . using typical coal mining technique with a Westinghouse 10 ton cable reel locomotive and a Joy loader. TIREX cables supply both with power.

To insure dependable, trouble-free operation of your drills, loaders and motors be sure you use TIREX portable cords and cables.

Simplex Wire & Cable Co., 79 Sidney Street, Cambridge, Mass.

SIMPLEX WIRES CABLES

New CATALOG OF GREENLEE TOOLS

For the
ELECTRICIAN
CARPENTER
PLUMBER

HYDRAULIC CONDUIT BENDERS
TUBE BENDERS
KNOCKOUT TOOLS
CABLE PULLERS
PUSH DRILLS
BORING TOOLS
SPIRAL SCREW DRIVERS
HYDRAULIC PIPE PUSHERS

Here's the new 1941 Greenlee Catalog 33-E that every user of tools in construction and maintenance work should have. This handy buying guide has been compiled to make it easy to select the right tools for the job . . . tools designed to make it easier and faster for the man on the job. Send the coupon today for your free copy of this valuable reference of Greenlee Hand Tools for the electrical worker, carpenter, and plumber. You'll learn how these tools can help make your job easier.

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1705 COLUMBIA AVENUE • ROCKFORD, ILLINOIS

TECHNICAL LITERATURE

FLUORESCENT LIGHTING—"Facts, Questions, Answers on Fluorescent Lighting" discusses the advantages of fluorescent lighting, contains facts with reference data, series of questions and answers pertaining to construction, operation, cost and use, and Do's and Don't's for fluorescent lighting in the home. Copies of booklet A-3939, priced at 5 cents, may be secured from Westinghouse Lamp Division, Bloomfield, N. J.

EFFECTS OF BONDING—Results are given of an investigation of the shielding benefits derived by bonding the sheaths of aerial exchange telephone cables to multi-grounded power system neutrals. The theoretical discussion is supported by data from an extensive survey of the effects of sheath-neutral bonding on noise, low-frequency voltage and electrolysis conditions in the telephone plant. Both areas served by public water systems and non-water-pipe areas are covered. "Effects of Bonding Exchange Aerial Telephone Cable Sheaths to Multi-grounded Power Neutrals," Engineering Report No. 43, publication H10, may be obtained from Edison Electric Institute, 420 Lexington Ave., New York, N. Y. Price 75 cents to non-members in U.S.A.

COPPER ALLOYS—Physical properties of condenser tubes, copper alloys for tube sheets, copper water tubes, and pole line hardware, characteristics of welding rod, are some of the data contained in a 16-page booklet, "Copper and Copper Alloys for Power Plants," obtainable from Revere Copper & Brass, Inc., 230 Park Ave., New York, N. Y.

WELDERS—Written for those concerned with equipment for resistance welding particularly of aluminum alloys, a 16-page publication discusses the various methods of welding especially with three-phase energy-storage type of equipment, also outlines the basic requirements for spot welding of aluminum alloys, and gives data on operation and results of tests. Company's equipment is described. To obtain a copy, direct requests to The Taylor Winfield Corp., Warren, Ohio, for Bulletin 1405.

TAPE—Characteristics, uses in various services, eleven methods and illustrations of application, of tape combining functions of "splicing compound" and friction tape, are contained in a pamphlet, Catalog Section 9270, available from the B. F. Goodrich Co., Akron, Ohio.

GUYING—Purpose of through-bolt guying, ratings and capacities of guy hooks, eye nuts, bolt eyes and curved washers of various sizes; sketches for methods of guying such as dead-end stress, aerial cable, two- and four-way storm, and stub: these are contained in a four-page folder "Simplified Guying Specifications" available from Malleable Iron Fittings Co., Branford, Conn.

BALL BEARINGS—New data to simplify the selection of bearings for various loads and lengths of service, dimensions, capacities, tolerances and mounting fits, as well as a list of principal types and sizes of forged steel ball bearings are provided in a "Handbook," 15th edition, Vol. 1, furnished by New Departure, Division of General Motors Corp., Bristol, Conn.

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Since nothing is perfect, we would not claim perfection for Chromel. It is true however that Chromel has an exceptionally high record of consistently good qualities. This applies to its life as a heating element, to even stretch, right temper, clean smooth finish and uniform resistance. You uphold your own good reputation when you specify Chromel. For technical data, ask for Catalog L.

HOSKINS MANUFACTURING COMPANY DETROIT, MICHIGAN

NEWS ABOUT PEOPLE

Nebraska Power Promotes Six Veteran Employees

Roy Page, vice-president and general manager Nebraska Power Co., recently announced promotions for six men in the sales, engineering, operating and accounting departments.

Glen A. Walker

GLEN A. WALKER, manager of the new-business department since 1939, was appointed general sales manager of the company. He has been with the utility since 1923, being industrial and power salesman until he became assistant manager of the rural division in 1936. Previously he had been superintendent of a power plant at Aurora, Neb.

FORD E. BATES, industrial sales manager since 1939 and an employee of the company since 1919, when he joined the engineering department, was appointed general sales consultant for the company. DEWEY G. BAKER, company statistician for the past thirteen years, was named assistant to the vice-president. ELDRED A. SWANSON, assistant substation engineer since 1930, was promoted to substation engineer to fill the vacancy caused by the death of W. R. Haselton on April 19.

ELLSWORTH E. SCHWALM, assistant commercial sales manager for the past six months and previously industrial engineer, power salesmen and supervisor of the commercial department for ten years, succeeds Mr. Bates as industrial sales manager. EDMUND H. LARSEN, a veteran of nearly twenty-two years service in the accounting department and assistant chief clerk of the general accounting department since 1937, succeeds the late Ernest L. Hecht as chief clerk of that department.

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▶ DR. ARTHUR S. ADAMS has been appointed assistant dean of the college of engineering at Cornell University. Dr. Adams joined the staff at Cornell a year ago, after an association with the Colorado School of Mines, where he was assistant to the president, as one of a group of three assistants to Dean Hollister. He has since been made professor of mechanics, secretary of the engineering experiment station, and director of extramural courses in charge of the engineering defense training program in Buffalo, Elmira, Binghamton, Geneva, and Ithaca.

▶ J. H. PAYNE, formerly chief of the electrical and radio division of the U. S. Department of Commerce, Washington, D. C., has become a member of the Rockefeller Foundation group of the National Defense Council at New York, N. Y., designed to co-ordinate commercial and cultural relations among the American republics.

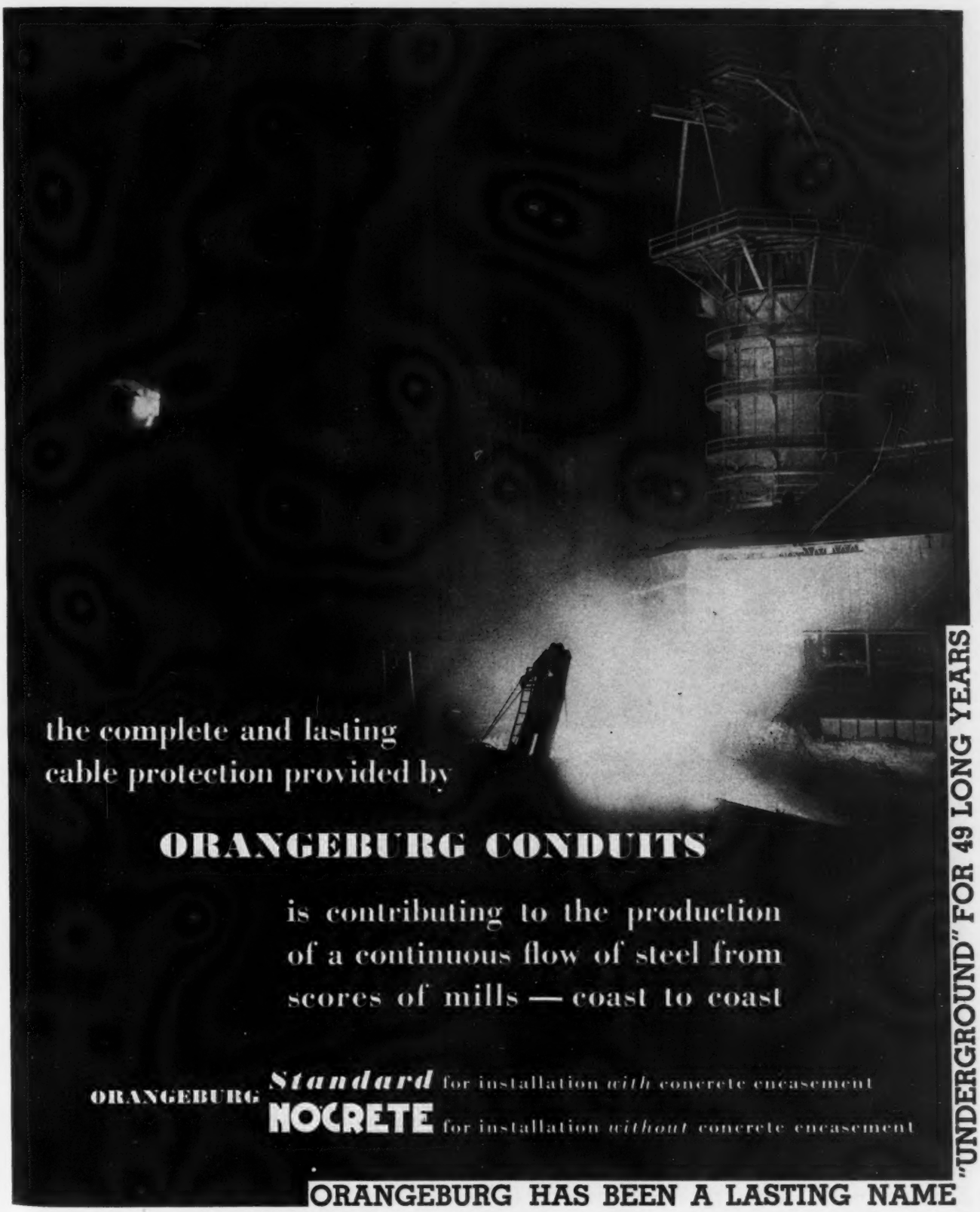
▶ E. D. OSTRANDER of Evanston, Ill., has resigned as superintendent of the division of rates and research of the Illinois Commerce Commission. Mr. Ostrander is to be employed on the Bonneville Dam project at Portland, Ore. K. E. THOLIN, who has been employed by the commission for 22 years, will be acting head of the rates and research division.

S. M. Sharp Becomes Chief Engineer of Southwestern

S. M. Sharp, for the past six years electrical superintendent for Southwestern Gas & Electric Co. in its Shreveport division, has been promoted to the position of chief engineer of the company, succeeding Andrew Patterson, deceased, according to an announcement by A. Lieberman, president of the utility.

Mr. Sharp came to Shreveport as division engineer in 1932 and was made electrical superintendent in 1935. Born in Alma, Ark., he received his degree of bachelor of science in electrical engineering from the University of Arkansas in 1923. Following a year in the Westinghouse Electric & Manufacturing Co. student engineering and shop course, Mr. Sharp went with the East St. Louis (Ill.) Light & Power Co. After three years in this work he came to the Central & Southwest Utilities Co. in Dallas, an associate company of Southwestern Gas, where he remained until 1932 doing design, engineering and construction work.

He is a member of the American Institute of Electrical Engineers.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▶ DR. HARVEY C. RENTSCHLER, director of research for the Westinghouse Lamp Division, recently received an honorary degree of doctor of science in engineering from Princeton University, from which he was graduated in 1903 and where he taught from 1904 to 1905. He was cited for his talents in the investigation of photoelectric cells and X-ray and electron tubes.

▶ A. J. KIEFER has been named assistant secretary of the Louisville Gas & Electric Co. and L. E. ACKERSON has been appointed assistant treasurer. Both have been employed by the company for periods of about fifteen years in accounting.

▶ E. H. ALEXANDER has been appointed engineer of the industrial control division of the General Electric Co.'s industrial department. A graduate of the University of New Hampshire, Mr. Alexander entered the G.E. test course in 1925 and in 1928 was transferred to the industrial general department. The following year he went to the company's district office in Philadelphia as an industrial control specialist. After being there ten years, he was transferred to the company's plastics department in Pittsfield, Mass., as commercial engineer of that department. He returned to Schenectady in 1940 to become the application engineer on electronic control in the industrial engineering department.

▶ JOSEPH E. CONLON of South Orange, N. J., first assistant prosecutor of Essex County, N. J., was recently sworn in as a member of the New Jersey Utilities Commission.

▶ HAROLD A. MAXFIELD and HOBART A. NEWELL have been promoted to full professorships in electrical engineering at Worcester Polytechnic Institute, and F. Harold Daniels, president of the Riley Stoker Corp., Worcester, has been made a life member of the board of trustees. Roland W. Packard, chief electrical and mechanical engineer of the Smith Paper Co., Inc., Lee, Mass., was made a trustee.

▶ KARR PARKER, president of the Buffalo Electric Co., has been elected president of the Buffalo (N. Y.) Chamber of Commerce. A native of Kentucky and a graduate of the University of Illinois, Mr. Parker has lived in Buffalo since 1915, when he became an electrical engineer at McCarthy Bros. & Ford. He was promoted to engineering manager in 1918 and in 1930 became president of McCarthy Bros. & Ford, predecessors to Buffalo Electric Co. He is a director and past-president of the Electric Association of the Niagara Frontier, past-president of the Association of Electrical Contractors of Buffalo and past-president of the Engineering Society of Buffalo. He is a member of the American Institute of Electrical Engineers and of the American Society of Mechanical Engineers.

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American Steel & Wire Promotes T. F. Peterson

Thomas F. Peterson has been appointed director of electric cable engineering and research of the American Steel & Wire Co., Cleveland, Ohio, where he will be connected with the office of the vice-president in charge of operations.

A native of Brooklyn, N. Y., and a graduate of Leland Stanford University, where he received his master's degree in electrical engineering, he obtained his first employment with the Brooklyn Edison Co. as cable engineer in charge of cable research.

He joined American Steel & Wire in 1927 as cable engineer in the New York office. Later he was promoted to electrical engineer and in 1931 was transferred to Worcester, Mass. In 1937 Mr. Peterson was appointed director of electrical cable works at Worcester, the position he has held until the present.

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▶ ROY R. HASSFURDER, formerly of Martinsville, Ind., has been appointed assistant division manager of the Vincennes division of the Public Service Co. of Indiana. Mr. Hassfurder takes over the duties formerly performed by Jesse A. Mishler, now manager of the New Albany division. He has spent the greater part of his business career in the public utility business. His first connection with the industry was as manager of the new-business department of the Merchants Heat & Light Co. of Indianapolis in 1921. He was transferred to Martinsville in 1928 as manager of the gas and electric properties there.

OBITUARY

▶ EDWARD A. HARLEY of New York, one of eight surviving pioneer members of the Edison Pioneers, died in New Rochelle Hospital, New Rochelle, N. Y., on July 9 after an illness of one week. He was 70 years old. Mr. Harley was honored at a dinner given for him by fellow members of the Edison Pioneers when he retired six years ago after 52 years in the employ of the New York Edison Co., now the Consolidated Edison Co. of New York, Inc. Mr. Harley was born in Brooklyn, N. Y., and went to work at an early age for the Edison company at the Pearl Street station.

▶ DONALD P. STONE, assistant head of the illuminating engineering division of the power sales department, Boston Edison Co., died suddenly at Marblehead, Mass., on July 5. He was graduated from Tufts College in 1920 and joined Boston Edison in 1923, becoming widely known as a lighting specialist in northeastern utility circles.

▶ ROY M. SNELL, resident engineer of the U. S. Bureau of Reclamation in charge of the railroad and utility relocation projects at Shasta Dam, died in San Francisco on June 30. He was 60 years of age.

▶ RICHARD NELSON SCOTT, 53, who superintended construction of several large tunnels, including the Twin Peaks bore in San Francisco, the Mount Zion tunnel in Utah and the Skagit tunnel in Washington, died July 7 in a Grass Valley, Calif., hospital. He had been in ill health for two years. Mr. Scott superintended tunnel work for the Seattle Light & Power Company for several years before taking the Twin Peaks job.

•

Dr. C. F. von Siemens

Dr. Carl Friedrich von Siemens, German electrical industrialist, died on July 10 in Berlin at the age of 68. Dr. von Siemens was the youngest son of Warner Siemens, founder of the Siemens concern and guiding spirit of Siemens & Halske, which became one of the most important electrical undertakings in the world.

Carl Friedrich joined the Siemens organization in 1899, and from 1902 to 1908 was manager of a branch of the London firm of Siemens Brothers & Co. In 1908 he returned to Berlin and four years later took over the Siemens Schuckert Works as chairman of the board of directors. In 1919 he became chairman of the supervisory board of Siemens & Halske and Siemens & Schuckert. It was under Dr. Von Siemen's directorship that the concern expanded to its present magnitude.

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4 Reasons Why
GULFCREST is the turbine oil of unparalleled quality
1. REFINED BY THE ALCHLOR PROCESS. The most thorough and effective method for removing chemically active hydrocarbons as well as the general run of impurities present in all crudes.
2. HIGHEST RESISTANCE TO OXIDATION. Because this famous ALCHLOR Process synthesizes and rearranges the molecular structure of certain hydrocarbons, resulting in a finished product of greater stability, GULFCREST OIL stands alone in its high resistance to oxidation.
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MANUFACTURING - MARKETS

General Electric Net 90 Cents Per Share

Net profit, after all charges, of General Electric Co. for the first six months this year totaled $26,033,665, as compared with $25,981,572 in the same period last year, equivalent in each case to 90 cents a share on the common stock, according to President Charles E. Wilson.

A dividend of 35 cents a common share, payable July 25, brings to 70 cents dividends for the first half of this year, same as for the 1940 period.

Net sales billed during the first six months totaled $300,322,085, the largest for any previous six months' period. This compares with $191,619,132 in the same 1940 period and an increase of 57 percent.

Mr. Wilson stated that the output of equipment for national defense is increasing rapidly. Billings covered equipment definitely known to be for defense purposes during the first six months of this year increased 210 percent over the same 1940 period.

Income account for six months ended June 30, 1941, compares as follows:

	1941	1940
Net sales billed	$300,332,085	$191,619,132
Costs, exp., etc.	228,817,121	151,325,052
Income fr. sales	$71,514,964	$40,294,080
Other income (net)	6,488,701	4,687,492
Total income	$78,003,665	$44,981,572
Fed. income & excess profits tax	52,000,000	19,000,000
Net profit	$26,003,665	$25,981,572

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Bonneville Awards Material Contracts

Awards of construction equipment and material contracts totaling more than $3,450,000 were made recently by the Bonneville Power Administration.

Largest single award was for oil circuit breakers to four companies as follows: Allis-Chalmers Manufacturing Co., $268,140; General Electric Co., $173,533; Pacific Electric Manufacturing Corp., $216,800; and Westinghouse Electric & Manufacturing Co., $264,620.

Second award covered construction of high voltage transmission lines as follows: H. H. Walker Co., $523,259, and Fritz Ziebarth, $245,872. Contract for suspension insulators was awarded to Corning Glass Works, $105,000. Westinghouse Electric & Manufacturing Co. received a contract for transformers on its bid of $580,980.

•

British Firm Ships in Overseas Trade

In two minutes a load of 8 tons can be brought up from a mine 6,000 feet down by an electric winder sent out from Great Britain by the British Thomson-Houston Co., Ltd., to one of the City Deep mines in South Africa.

Two similar equipments completed for South Africa carry drums 36 feet across, believed to be the largest ever made for electric winders. Forty tons is the weight of the single-piece flywheel in cast steel included in each motor generator set for equalization purposes.

The company has turned out many overseas jobs during the past year, it was said, including large turbo-alternators for India, Canada and Australia.

The company is now building four additional rectifiers for the Natal section of the South African Railways similar to those supplied a few years ago for the main line electrification between Durban and Volksrust.

•

Buys Transformers

The Burbank, Calif., City Council has accepted the bid of the Pennsylvania Transformer Co. at $26,760 for furnishing transformers for installation in the municipal steam-electric power station.

Westinghouse Gives 9% Bonus in July

An adjustment upward of 9 percent will be made in wages and salaries of employees of Westinghouse Electric & Manufacturing Co. this month in accordance with the wage and salary plan. The bonus in June was 11 percent.

Net profit for June was $1,570,053, for May $2,093,344 and for April $2,277,740, a total of $5,941,137 for the quarter ended June 30. Based on monthly earnings figures, net profit for the first six months was $11,568,400, equivalent to $4.33 a share on combined preferred and common stocks. This compares with $9,837,012, or $3.68 a share, on combined shares for the same 1940 period.

Westinghouse will build a $22,000,000 plant for the manufacture of steam turbines and gears for merchant ships for the United States Maritime Commission, under lease agreement with the Defense Plant Corp., RFC subsidiary, according to R. A. McCarthy, vice-president. The plant will adjoin the South Philadelphia steam division works and more than 1,500 workers will be employed.

The company has received an order for electric drive and control equipment for seven 100-mile-an-hour streamlined electric locomotives with 56,000 total maximum horsepower from the Pennsylvania Railroad.

•

Award Contracts for Parker Dam

Contracts totaling $502,092 have been awarded by the Department of the Interior for additional power equipment for the four generating units at the Parker Dam power plant on the Colorado River.

Westinghouse Electric & Manufac-

turing Co. will furnish a 30,000-kva. generator for $367,700 and a 161,000-volt lighting arrester for $5,325.

Moloney Electric Co., St. Louis, will supply three power transformers, each rated at 10,000 kva., for $102,350.

Kelman Electric & Manufacturing Co., Los Angeles, will furnish a 161,000-volt, 1,200-amp. oil circuit breaker for $26,717.

•

Awards $95,300 Contract

Construction Quartermaster, Savanna Ordnance Depot, Proving Ground, Savanna, Ill., has awarded contract to C. A. Hooper Co., Madison, Wis., at $95,300 for installation of an electrical distribution system at local proving ground.

•

Opens Atlanta Office

Announcement has been made by the A. B. Chance Co., Utilities Division, Centralia, Mo., of the establishment of an office in Atlanta, Ga. This office will be under the supervision of the company's southeastern sales manager, W. A. Moss, who will continue to represent the company in that territory. He will maintain headquarters in this new office at 1925 Rhodes-Haverty Bldg., Atlanta.

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Copperweld Earnings

Net earnings of Copperweld Steel Co. for the six months ending June 30 totaled $919,952, equal after preferred dividends to $1.68 a share on the common stock. This compares with net of $521,314, or $1.05 a common share, in the same 1940 period.

•

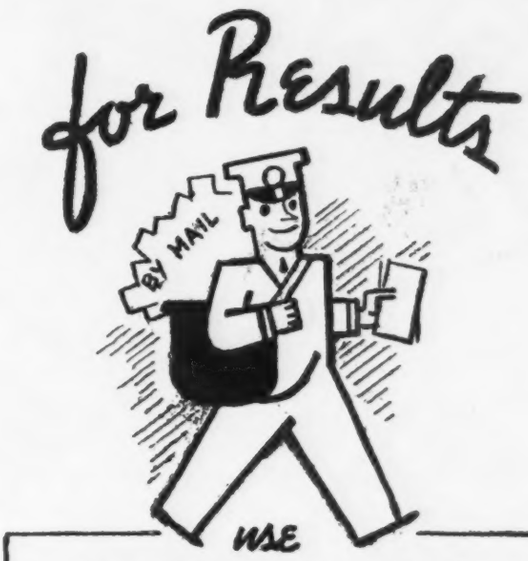
Toastmaster Sales Plan

Anticipating fall and Christmas sales volume surpassing that of any previous period, W. E. O'Brien, sales manager of McGraw Electric Company's domestic appliance division, announces a comprehensive merchandising and advertising program designed to continue the sales increases of Toastmaster products since 1932.

New York Metal Prices

	July 15, '41 Cents per Pound	July 22, '41 Cents per Pound
Copped electrolytic.....	12.00*	12.00*
Lead, A. S. & R. Price	5.85	5.85
Antimony	14.00	14.00
Nickel, Ingot	35.00	35.00
Zinc Spots	7.64	7.64
Tin, Straits	53.375	53.375
Aluminum, 99 per cent..	17.00	17.00

*Delivery Connecticut Valley.



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How many of the catalogs of these companies can you find *quickly?* How many of them would you keep on your desk, in one compact volume?

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American Brass Co.
American Steel & Wire Co.
American Transformer Co.
Austin Co., M. B.
Bell Lumber & Pole Co.
Brown Co.
Clover Co., F. G.
Cope, Inc., T. J.
Cornell-Dubilier Electric Corp
Delta-Star Electric Co.
Eastern Specialty Co.
Electric Power Construction, Inc.
Electric Power Equipment Corp.
Electric Service Supplies Co.
Electrical Engineers Equipment Co.
Erie Electric Co.
Fast & Co., John E.
Fibre Conduit Co.
Gardner Electric Mfg. Co.
General Electric Co.
Illinois Electric Porcelain Co.
Imperial Porcelain Works, Inc.
I-T-E Circuit Breaker Co.
Johns-Manville Corp.
Kuhlman Electric Co.
Moloney Electric Co.
M & W Electric Mfg. Co.
National Pole & Treating Co.
Naugle Pole & Tie Corp.
Okonite Co.
Pacific Electric Mfg. Corp.
Page & Hill Co.
Partridge Lumber Co., T. M.
Pennsylvania Transformer Co.
Porcelain Insulator Corp.
Reliable Electric Co.
Rockbestos Products Corp.
Roebling's Sons Co., John A.
Roller-Smith Co.
Scott Pole & Treating Co.
South Bend Current Controller Co.
Spero Electric Corp.
Standard Transformer Co.
United States Rubber Co.
Valentine Clark Co.
Victor Insulators, Inc.
Wagner Electric Corp.
Westinghouse Electric & Mfg. Co.

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★ ★ ★

1941 ELECTRICAL BUYERS REFERENCE
1 MANUFACTURERS' CATALOGS
2 DIRECTORY OF MANUFACTURERS
3 INDEX TO DIRECTORY CLASSIFICATIONS
COMPANY AND TRADE NAME INDEX

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Most Panelboards Need Type NT Terminal Blocks

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Field Reports on Business

Electrical manufacturers report increasing business, with government orders growing and proving practically a profitless business. Utilities are placing a variety of orders for construction now under way and being planned. Sales of electrical appliances continue in good volume.

NEW YORK

Views in Washington that non-defense building construction should be curtailed are meeting with a cold reception as building in this area continues at a fast clip. New subdivisions are under way to take care of expanding housing needs. Home electrical equipment and appliances are in good demand.

Nearly 300 new defense plants or expansions to defense plants costing over $18,000,000 have been under construction in the state since June, 1940. Thirty per cent more workers are employed now and they are earning the highest wages in history; the average is $33.75 a week. Over 450,000 jobs have been filled by the New York State Employment Service since last June.

Indications are that domestic production of copper will be increased to meet the rising defense demands.

Efforts are being made to work out priorities and quotas for electric appliances for next year. Indications are that there will be some curtailment in production. Impending shortage of materials for use in manufacturing laundry equipment, refrigerators, ranges and smaller appliances will necessitate curtailment of production. Makers of refrigerators believe that an "official" reduction in the near future is unnecessary as volume is tapering off.

Utilities are buying meters, transformers, condensers, switchgear and oil circuit breakers. Inquiries on turbines have increased, with volume of business over next few months due to swell.

Engineering construction awards for last week totaled $206,765,000, 25 percent higher than a year ago.

NEW ENGLAND

Steps are being taken to provide further substantial increases in public utility steam-generating capacity in this district to meet future demands of the defense program. Approximately $6,000,000 is involved in plans for industrial plant expansion in Connecticut. Government contracts continue to sustain a strong and steady electrical market.

Small motor sales are keeping up at a good pace. Several recent orders include a number of 10-hp. ratings for large special machines destined for heavy ordnance contracts; fractionals are in demand, and motor pumping units are being priced for several cantonment installations in this area. Seymour Manufacturing Co., Seymour, Conn., has purchased 1,200 kva. in capacitors. Electric alarm and signaling apparatus is in demand. Gamewell Co. reports the largest sales volume in its history covering electric signaling equipment for the defense program and municipal services.

The Lynn G.E. plant will participate largely in the construction of equipment for turbine-electric oil tankers to cost about $2,700,000 each and totaling $16,000,000. New England concerns received a total of $2,307,116 in contracts for the Quartermaster's Department during the past week, including disbursements for cantonment improvements which involve encouraging amounts of wiring materials for lighting.

Ground has been broken for the new government airport at Bedford, Mass., which will cost in the neighborhood of $500,000. Boston & Maine R.R. has purchased two G.E. 44-ton Diesel-electric switching engines.

PACIFIC COAST

Western stocks are fair, except in steel conduit fittings of all kinds. Mid-year orders for holiday appliances are being shipped or promised without much reduction in quantity. It is predicted that the stock pinch will be perceptible by September.

Outstanding prospective business covers three 150,000 turbines and three governors for Grand Coulee, Newport News Shipbuilding & Drydock Co. being low on the turbines at $1,800,000 and Woodward low on the governors at $82,992. Lighting sales are featured by many flying field awards, averaging $25,000 each from Wenatchee, Wash., to Phoenix, Ariz. New fields just begun include Stockton, Sacramento and Merced, averaging $800,000 each, and a $4,000,000 flying school at Merced, all in central California. Municipal housing projects cover 400 dwelling units costing $2,200,000 and 295 units costing $1,302,000, both in Los Angeles.

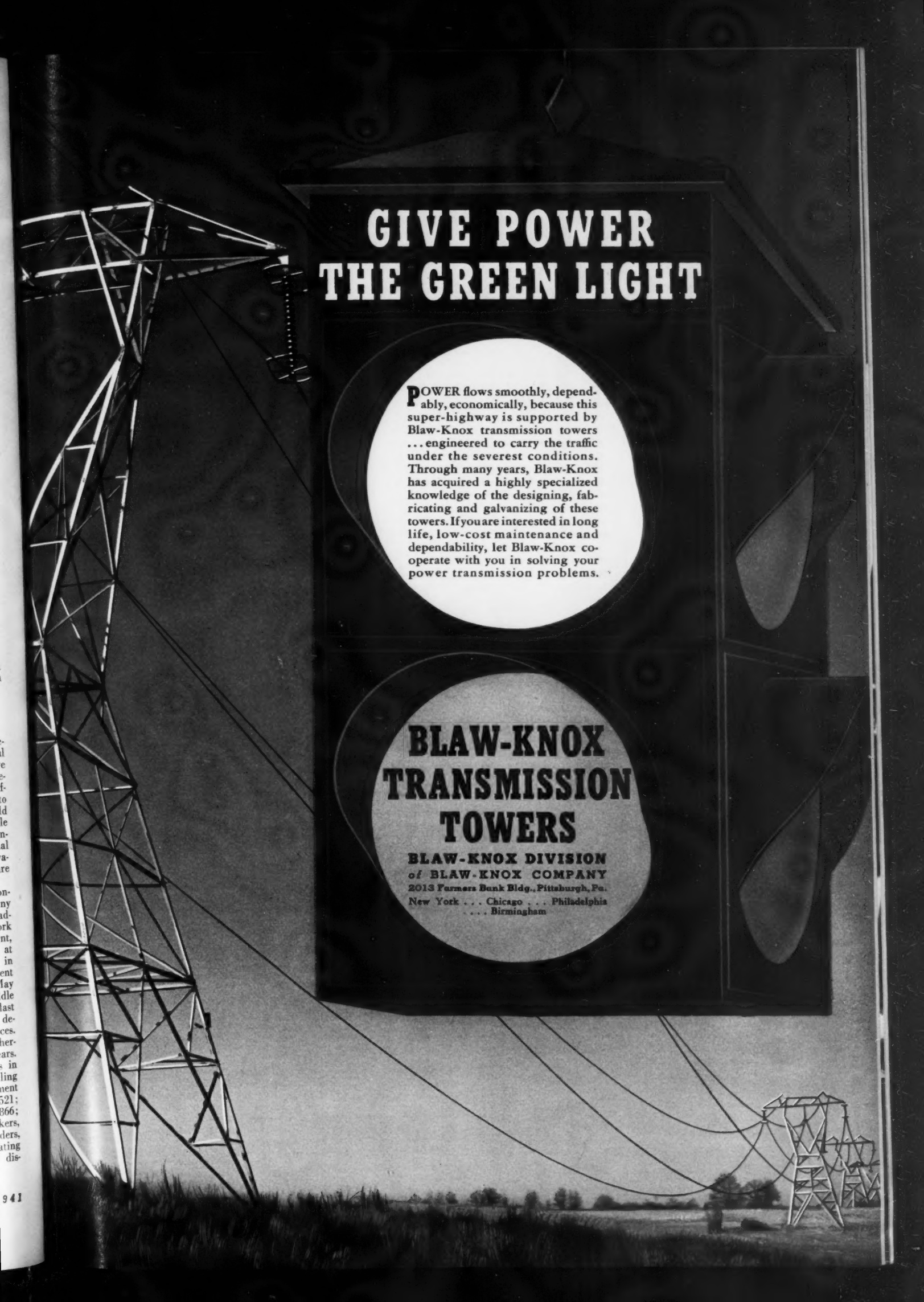
New REA work, which has now slowed down with approaching end of construction season, covers 37 miles for 222 consumers in Lane County, Oregon, and 320 miles around Pomeroy, Wash. An additional appropriation of $100,000,000 for Pacific naval bases is expected, with a high proportion of electrical equipment.

CHICAGO

With priority regulations on raw materials becoming more widespread, electrical manufacturers are feeling the pinch more severely. Delivery dates are continually being extended because of the increasing difficulty in securing materials and parts to fulfill orders. In numerous instances old stocks are being delivered as acceptable substitutes. Because of the long delays encountered in getting material, industrial concerns are placing orders for a wide variety of electrical equipment for future maintenance and repair work.

With further curtailment of durable consumer goods production imminent, many manufacturers stand to suffer severe adjustments in operations until defense work can be properly allocated. For the present, however, industrial activity continues at peak levels. Employment and payrolls in this area during June increased 2.4 percent and 4 percent, respectively, over the May figures. Retail trade throughout the Middle West is from 25 to 28 percent ahead of last year and merchants report a sustained demand for home furnishings and appliances. It is significant that buying in the higher-priced lines is heavier than for many years.

During the past week 72 companies in this area received defense orders totaling $8,178,000. Orders for electrical equipment included telephone apparatus, $73,521; head sets, $138,000; switchboards, $116,866; wire and cable, $41,797; circuit breakers, $24,723; switches, $32,928; arc welders, $52,500; transformers, $17,610; generating units, $84,946; microphones, 204,286; distribution panels, $17,640.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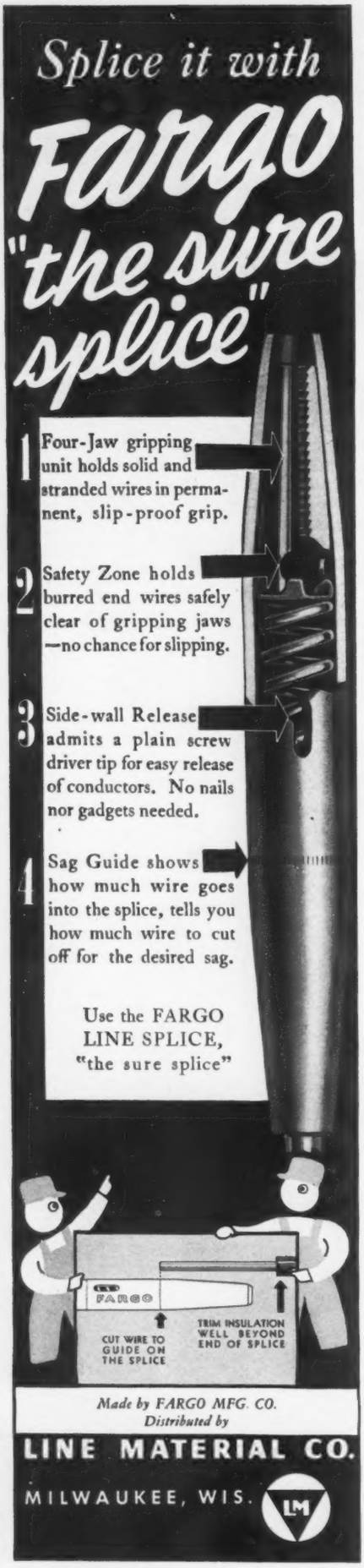
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Sales Opportunities

OSAGE, IOWA—City Council receives bids until August 11 for extensions and improvements in municipal electrical distribution system, including connections with new municipal power station, and complete ornamental street-lighting system in downtown district. Hubbard Engineering Company, 415 North LaSalle Street, Chicago, Ill., is consulting engineer.

DEARBORN, MICH.—Graham-Paige Motors Corporation, 8505 West Warren Street, Detroit, Mich., plans installation of motors and controls, switchgear, transformers and accessories, conveyors and other equipment in connection with expansion in plant at Dearborn for production of parts for marine engines for Government. Appropriation of $900,000 will be secured through Defense Plant Corporation, Washington, D. C., a federal agency, for project.

PORTLAND, ORE.—United States Engineer Office, Pittock Block, Portland, receives bids until August 12 for control switchboards (Circular 13).

SAVANNAH, GA.—Savannah Electric & Power Company has approved plans for addition to Riverside steam-electric generating station and will proceed with work at once. Additional equipment will be installed for increased capacity. Construction also is scheduled to begin soon on new 110,000-volt, 70-mile transmission line for connection with system of Georgia Power Company, Atlanta, Ga., for interchange of power, previously referred to in these columns.

CODY, WIS.—Bureau of Reclamation, Denver, Colo., plans new transmission line from Thermopolis, Wyo., to Cody, about 85 miles, to form link between power plant at Seminoe, near Casper, Wyo., and hydroelectric power development at Shoshone dam, comprising part of Shoshone project. Cost about $300,000. Appropriation in that amount has been authorized.

HOUSTON, TEX.—Houston Shipbuilding Corporation, Chronicle Building, plans installation of motors and controls, duct lines, transformers and accessories, switchgear, electric hoists, electric cranes, lighting system and other equipment for expansion in shipbuilding plant at Irish Bend Island, for construction of vessels for United States Maritime Commission, Washington, D. C. Company now has work under way on initial plant, comprising nine shipways, with shops and other mechanical structures; expansion will include nine additional shipways and corresponding increase in shops, warehouses and other buildings. Cost estimated about $7,000,000 and fund in that amount will be furnished by Government for project.

CHICAGO, ILL.—Commonwealth Edison Company has authorized immediate construction of new addition to Fisk Street electric generating station, Fisk Street and Cermak Road, to be known as unit No. 18, for expansion in boiler department and switching division. It will be three-story, 53 x 91 feet, reported to cost close to $300,000. It will supplement another extension in this plant, for which building permit was issued recently, as previously noted in these columns. Shaw, Naess & Murphy, 80 East Jackson Boulevard, are architects; Sargent & Lundy, Inc., 140 South Dearborn Street, is consulting engineer.

SAN FRANCISCO, CALIF.—Signal Corps Procurement District, Presidio of San Francisco, receives bids until August 6, for 31 voltage regulators; also for 10,000 fuses (Circular 2).

BETHANY, OKLA.—Oklahoma Gas & Electric Company, Oklahoma City, Okla., has plans maturing for extension in 13,200-volt transmission line from present terminus at Bethany to new water-pumping station of that municipality at Bluff Creek, about seven miles distant, where service will be furnished. Power substation facilities will be provided at latter point.

NEW BRITAIN, CONN.—New Britain Machine Company, manufacturer of automatic screw machines, parts, etc., plans installation of motors and controls, switchgear, lighting facilities, conveyors and other equipment in connection with expansion in local plant and branch works at Berlin, Conn., for production of tools for Government. Fund of $650,000 is being secured through Defense Plant Corporation, Washington, D. C., a Federal agency, for purchase of machinery and equipment.

CANTON, OHIO—Ohio Power Company plans expansion and improvements in Torrey power substation on Sherman-Church Road, with installation of transformers and accessories, switchgear and auxiliary equipment for increased capacity. Cost reported over $400,000. Company also will carry out a similar extension program at Sunnyside power substation, vicinity of Waco, Ohio, to cost approximately $250,000. This is part of 1941 development program of company.

DENVER, COLO.—Bureau of Reclamation, Denver, receives bids until August 18 for one 103,000-hp., vertical-shaft hydraulic turbine, and one oil-pressure, actuator-type governor, for installation in Shasta hydroelectric power plant, Central Valley project, Calif. (Specifications 975). Also, until August 19 for three 34,600-hp., similar type hydraulic turbines, and three oil-pressure actuator-type governors, for installation in Keswick hydroelectric generating station, same project (Specifications 976). Equipment in both cases will be installed by Government.

TAHAWUS, N. Y.—Titanium Pigment Corporation, 111 Broadway, New York, N. Y., affiliated with National Lead Company, same address, plans installation of motors and controls, duct lines, switchgear, transformers and accessories, industrial lighting facilities, conveyors and other equipment in new titanium products mill at Tahawus (Essex County), consisting of several one and multi-story production units and auxiliary structures. Also will erect a housing development for employees at plant, with dwellings and other buildings equipped for electric service. Entire project reported to cost over $5,000,000. Work is scheduled to begin soon. Archer E. Wheeler, 25 Broadway, New York, is metallurgical engineer.

MUSCATINE, IOWA—Municipal Water and Light Board, Herman Zeug, secretary, receives bids until August 12 for extensions and improvements in municipal power plant, including turbine room switchgear, boiler room switchgear, coal and ash-handling equipment, boiler feed pumps and mechanical draft apparatus. Stanley Engineering Company, Muscatine, is consulting engineer.

Railway Catenary Bridges Carry Utility 66-Kv. Tie

[*Continued from page 35*]

the rock it was found that no dowels were necessary because of the natural roughness, which provided a satisfactory bond. The concrete for the caisson foundations was deposited under water by means of a closed Tremie bucket.

The other two legs on the land side are supported by concrete foundations on 25-ft. piles. The tower is entirely independent of the railroad structure, which is on a viaduct at that point, and it is thoroughly braced by trusses beneath the track girders and above the catenary system. A temporary wood platform of 3-in. plank supported on 12-in. steel girder beams built over the tracks permitted construction above this point to proceed without hazard to trains passing underneath.

All transmission wires were strung on the outside of the structures away from the tracks on 12-in. pulling blocks, then lifted over to the inside of the structure to prevent coming in contact with trolley wires and sagging on railroad right-of-way. The four wires were run in pairs and pulled by power winches mounted on trucks. Reels were mounted on specially constructed reel jacks and controlled by means of brake bands and drums. Wires were pulled to tension by the sag method and checked by shunt dynamometer.

The railroad company assigned a transmission foreman to the work, who arranged for all work clearances and saw that the necessary protection was applied to safeguard all construction men.

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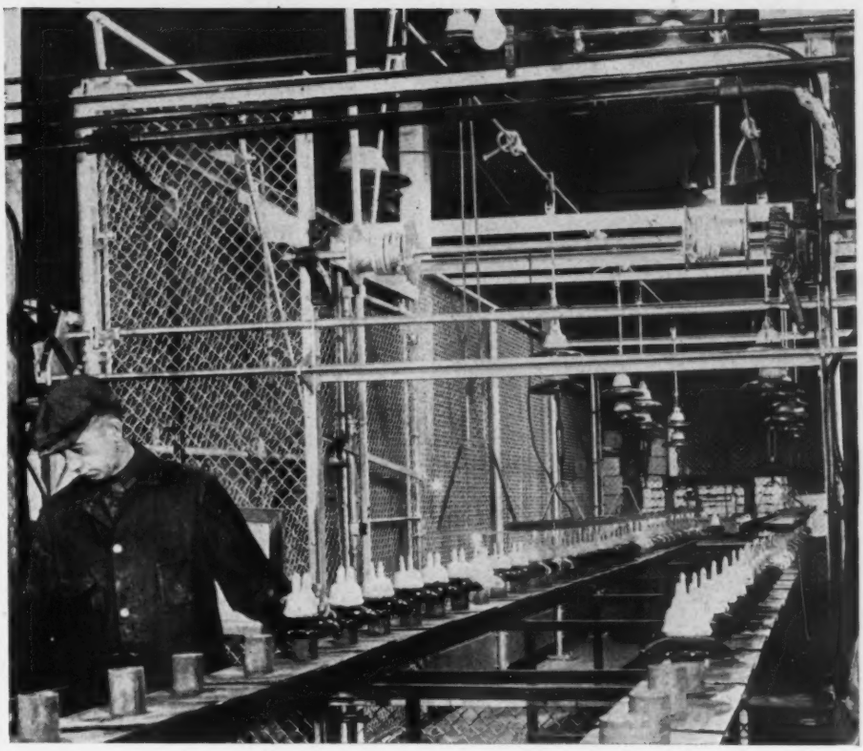
Canadian Output Up

Production of Canadian central electric stations reached an "all-time high" of 2,805,394,000 kw.-hr. in May, the Dominion of Bureau of Statistics reports. The May production represented a 5 per cent increase over the 2,671,567,000 kw.-hr. produced in May, 1940. Total for the first five months this year was 13,172,325,000 kw.-hr., against 12,339,620,000 kw.-hr. in the corresponding period of 1940. May exports to the United States totaled 210,495,000 kw.-hr. against 193,354,000 kw.-hr. in May, 1940. Total exports in the first five months of 1940 were 992,815,000 kw.-hr., compared with 808,314,000 kw.-hr. in the same period of last year.



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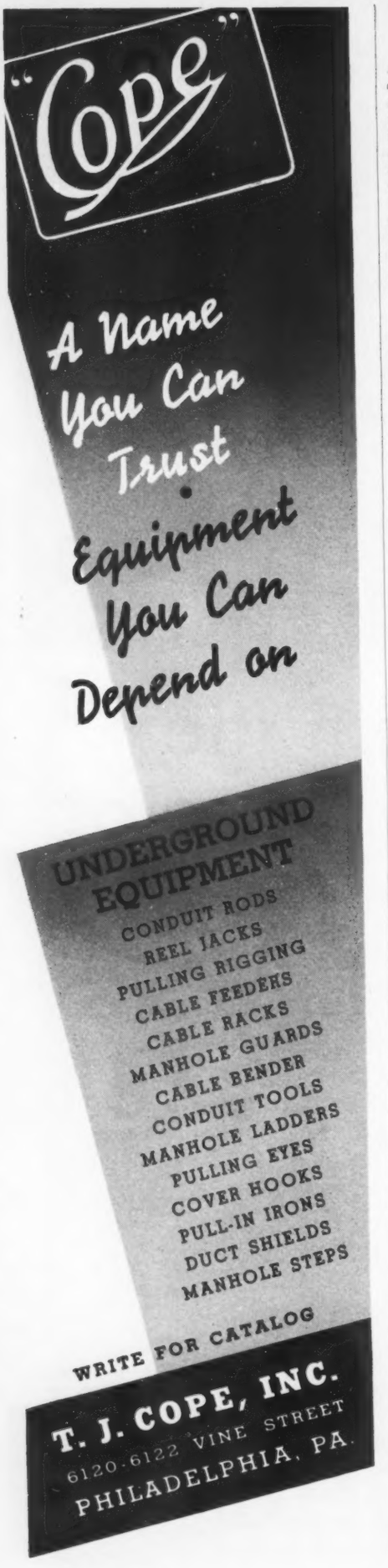

Recent Rate Changes

ALABAMA POWER CO. has received approval of the state Public Service Commission on rate reductions affecting current sold to municipalities, cooperatives and private utilities for resale, estimated to lower the company's annual revenue by about $16,500. Under the new schedule, purchasers may obtain at rate of four mills per kw.-hr. for residential sales up to 50 percent of the total kw.-hr. They are given a five-mill rate for energy in excess of 250 kw.-hr. and the privilege of obtaining an additional five percent discount on their bills by installing their own substations.

ARKANSAS UTILITIES CO. has received approval of electric rate schedules posted with the Utilities Commission, covering nearly all towns served by the company with the exception of Paragould and Helena, where the existing rates were virtually unchanged.

CENTRAL VERMONT PUBLIC SERVICE CO. and Twin States Gas & Electric Co. have filed new tariff rates with the state Public Service Commission, to take effect August 1 and bringing about reductions for 40,000 customers totaling over $155,000, about $129,000 of which will accrue to customers of the Central Vermont utility. Under the new tariff, for both residential and farm customers, the first 20 kw.-hr. will be billed at eight cents per kw.-hr., the next 30 at five cents, the next 60 at three cents, and all above 110 kw.-hr. at two cents per kw-hr.

CINCINNATI GAS & ELECTRIC CO. and city council officials of Hamilton, Ohio, have signed a new electric rate contract, effective to 1947, which will mean an approximate saving of 14 percent to consumers, according to councilmen.

ILLINOIS COMMERCE COMMISSION reported that electric rate changes effective during June resulted in an estimated decrease in annual operating revenues of $11,619. Reductions in residential rates accounted for $10,363 of the total, $6,986 of which was represented by reduction in rates of Central Illinois Light.

INDIAN LAKE POWER & LIGHT CO. has received permission from the New York Public Service Commission to put into effect revised rates for electricity which will result in savings of $3,000 a year to customers in part of the town of Indian Lake, Hamilton county. Of the total, $2,000 will be in the residential classification and $1,000 for commercial service.

NEW YORK STATE ELECTRIC & GAS CORP. will reduce rates for wholesale service in the Binghamton district by $38,500 per year, according to the state Public Service Commission, as part of the $1,200,000 reduction recently ordered by the Commission. Under the company's new filing, it is proposed to make the present wholesale rate applicable for any use to customers who guarantee 50 kw. or more monthly demand. Substantial reductions will be made in the demand portion of the rate, with certain other changes in the energy charges.

OHIO PUBLIC UTILITIES COMMISSION has approved lower electric rates for seven small utilities serving 19 western Ohio cities and towns estimated to effect about $20,000 savings to customers. Utilities affected are: Bradford & Gettysburg Electric Light & Power; Brookville & Lewisburg Lighting; Eaton Lighting; Buckeye Electric Light & Power; Greenville Electric Light & Power; New Madison Lighting; Western Ohio Public Service.

PAINESVILLE, OHIO, CITY COUNCIL has passed an ordinance slashing municipal electric rates, effective August 15, saving consumers in the area approximately $15,000 a year. For the first 70 kw.-hr., the new charge is 3½ cents; for the next 430, 2½ cents; for the next 500, two cents. Eighty-eight percent of the city's light customers fall within the 200 kw.-hr. bracket.

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Municipal Plants

BARDWELL, KY.—This town of 1,500 population has bought Bardwell lighting system from Central States Power & Light Co., paying $55,000 for this and the water system. Later, it hopes to supply energy bought from the Tennessee Valley Authority on a wholesale basis.

BOONVILLE, IND.—City has completed purchase of local electric light plant from Southern Indiana Gas & Electric Co. for $310,000, culminating a six-year fight by the city. According to Mayor Lafayette O'Haver, the plant will be revamped and another generator installed.

DES MOINES, IOWA—City Council has authorized group of five local men to determine "terms and conditions" upon which city might acquire property of the Des Moines Electric Light Co. Question of municipal ownership of the electric light and power plant has been brought up from time to time but many question the feasibility in view of the low rates the utility has given the city.

DES MOINES, IOWA—Iowa Tax Commission has taken the stand that municipally owned power systems must pay taxes on lines serving customers beyond the city limits. Municipally owned plants at Webster City and Muscatine have obtained temporary injunctions to prevent the commission from assessing such lines and similar actions are expected from other municipalities. The commission holds that such lines are taxable the same as similar lines of private utilities. Court decisions are expected to be of particular interest because of the various public ownership drives now underway in the state.

LANSING, MICH.—Board of Water & Light Commissioners has voted to install an additional 5,000-kva. transformer at the Olds Motor Works. The transformer, to be located on Oldsmobile property, will cost an estimated $23,000 for installation, according to Otto E. Eckert, general manager of the board.

MCGREGOR, IOWA—Revenue bonds of $120,000 to finance the construction of a municipal electric light and power plant here have been sold to J. J. Kelly, Ind., of Des Moines, on open bids with 15 companies bidding. Bonds were sold at par plus accrued interest plus premium of $2,926 and are to bear 2½ percent interest. Construction has been started on the plant.

MUSCATINE, IOWA—In the fiscal year ending March 31, 1941, the municipal light and water plant earned a net operating profit of $18,377, according to the board of waterworks and light trustees. Gross earnings were $88,613 for the year, approximately $11,000 less than for the previous year, due to a rate reduction on April 1, 1940. Only $76,000 of the original bond issue of $350,000 remains unpaid and this is expected to be paid during 1941-42. Of the income received by the electric plant, 42.3 percent was spent for generation, 25.3 percent for distribution, with 24.3 percent for net income.

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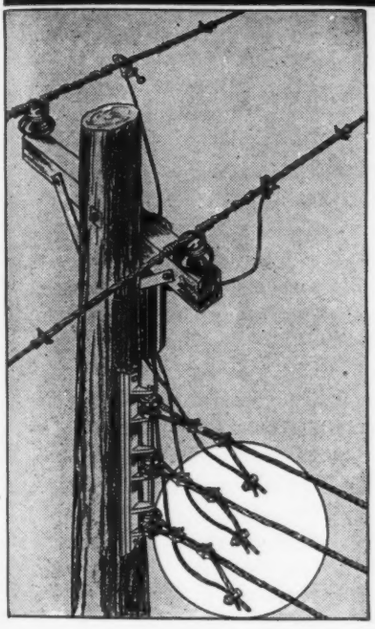

Rural line transformer pole with a secondary span to a yard pole.

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Three-Phase Network for Denser Loads

[*Continued from page 38*]

cuit wiring was increased in size, at a slight cost, to reduce voltage drop in starting, more as a precaution than as a necessity. However, single-phase, 220-volt motors with heavy-duty starting requirements must have 10 percent spare capacity at this voltage to operate satisfactorily at 208 volts.

Standard 220-volt motors and controls can be used successfully on this network.

Motor rewinding called for a new set of stator coils for three-phase, 208-volt service. Regrouping or reconnection of existing windings was not permitted. Rewound motors, with controls, had to have essentially the characteristics as before, and all were required to operate satisfactorily at rated load and frequency between 10 percent above and 10 percent below 208 volts. Two-phase motors usually had resistors in each phase if starting resistance was required, and these were reconnected for three-phase motors by putting one bank in each of two phases and having no resistors in the third phase. Starting currents had a tendency to balance themselves very readily with resistors thus connected. A total of 130 motors (two-phase, 220-volts) were rewound for three-phase, 208 volts. These ranged from $\frac{1}{8}$ to 15 hp. Forty percent had to be rewound on overtime basis. A total of 34 elevator motors were also rewound ranging from $4\frac{1}{2}$ to 30 hp.

Controls and Wiring

Present motor starters, controls and wiring fortunately require only slight modification for operation on the three-phase, 208-volt network. NEMA standards specify that all such devices shall withstand 110 percent rated voltage and run successfully at a minimum of 85 percent. Existing wire sizes for two-phase, 220-volt motors have been found large enough for motors rewound for three-phase, 208-volts except for $7\frac{1}{2}$ hp., 25 hp. and above. Feeders to such motors were increased in size. One wire was eliminated on right-sized feeders. All fuses that were "too close for comfort" for starting currents were replaced by super-lag fuses, and this was general on elevator motors because of their low speed and heavy

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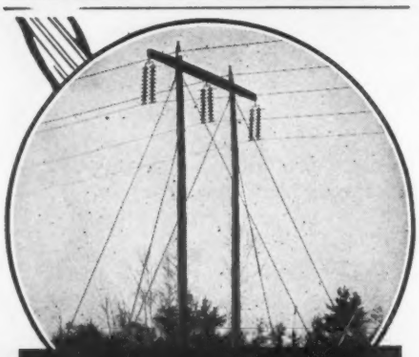

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starting duty. Expert detailed attention, as previously indicated, was necessarily given to electric elevator changeovers.

Elevator Alterations

Two men were able to alter electric elevators in six to eight hours for a single-speed car switch controlled elevator and in about 36 hours for a two-speed car switch controlled elevator. The installation of additional limit switches, etc., required extra labor after changeover. All single-speed elevator motors were replaced with a previously wound spare stator to save time in changeover. In the first-year program 34 elevators were changed over.

Heating and cooking equipment rated at 220 volts and thermostatically controlled, such as bakeovens, grease kettles, steam tables, hot water heaters and doughnut machines, required no change in heating elements. Large units, however, required reconnection to obtain balance on three-phase service. In general, all appliances without thermostatic control require new elements rated at 208 volts for successful operation. Appliances rated at three-wire, 115/230 volts and using 115-volt elements will operate satisfactorily on three-wire 120/208-volt service.

Interior wiring requires careful surveying of light and power feeders and branch circuits in regard to wire sizes and load balances, with special attention to fuse sizes. Feeders that formerly were operating satisfactorily on existing fuses may cause trouble from excessive heating at fuse clips due to increase in current when cut over to three-phase, 120/208-volt operation. Careful redivision of the load may prevent this; if not it will be good insurance to install next larger size fuses if the National Electrical Code will so allow. Careful tightening, cleaning and realigning fuse clips will reduce heating 20 to 30 percent and sometimes more.

All two-phase, five-wire, 115/230-volt light panels were reconnected as two separate three-wire, 120-208-volt sections. Feeders were altered to suit by pulling in one additional wire in the same conduit, for extra neutral, on feeders up to No. 2 rubber-covered wire. The advent of thin-wall insulation saved the cost of installing new conduit on feeders larger than No. 2 rubber-covered, requiring extra neutral. Feeders larger than No. 2 rubber-covered required removal of present conductor and replacement with conductor of the same size but with thin-wall insulation.

The supply of lighting and household appliance load from each phase wire to neutral at 120 volts allows the use of standard lamps and appliances with the nameplate ratings already employed on the Hartford system. Grounding the neutral limits the potential to ground to 120 volts, well within the code requirements. Combined light and power loads can easily be balanced between phases.

Weekly Checks of Tie Lines

No supervisory control of transformers on the network area is being installed. However, tie lines are removed from service one by one each week during a light-load period and checked for back-feed to see if relays are operating properly. Vaults are subsequently visited and checked for proper protector operation.

In cutting over Hartford's two-phase downtown distribution system to the three-phase network simultaneous operation of both systems is temporarily required. Little difficulty has occurred, but in one case a section of four-conductor network cable was damaged during the removal of a section of two-phase lead cable from a duct occupied by the network cable. The lead cable wore through the rubber insulation of one network conductor, grounding it to the neutral via the lead sheath. The network cable burned clear with slight damage to the neutral and none to the other two-phase conductors.

In 1940 about 30 percent of the network system was installed and cut in and the corresponding radial system removed. The remainder is to be completed in 1943, and ultimately the network area may be expanded to include a larger portion of Hartford's downtown section.

•

Orders Lines Rehabilitated

The New York Public Service Commission has ordered the LaFargeville Electric Light Co. to rehabilitate its distribution lines and make other changes in its system to improve service to its customers in the towns of LaFargeville and Theresa by August 15. The company is a subsidiary of Oswegatchie Light & Power Co. and purchases its power from Central New York Power Corp.

Instrument Assembly Simplifies Relay Field Testing

[*Continued from page 40*]

termediate current values, two 45-ohm resistors in parallel with a 125-ohm fixed and variable resistor for the low currents.

A 600-ohm rheostat which may be used as a variable resistor or potentiometer with or without an additional fixed resistance of 1,200 ohms supplies variable voltage from 0 to line potential and a 25-volt-ampere, 110/220-volt auto-transformer for overvoltage values. Connections between the two cases are made by jumpers through polarized slip lock receptacles with external connections to the source and relays under test through binding posts on the cases. All leads, necessary tools and relay repair parts are carried in a separate case to limit unit size and weight.

Operating instructions accompanying the equipment give detailed information for testing relays of the various types, which include the following: (1) Over- and under- voltage; (2) over and under-current; (3) directional over-current; (4) directional ground; (5) polyphase directional; (6) phase current balance; (7) percentage differential; (8) power directional; (9) selective differential current; (10) thermal; (11) definite timing; (12) transfer; (13) flash; (14) impedance.

•

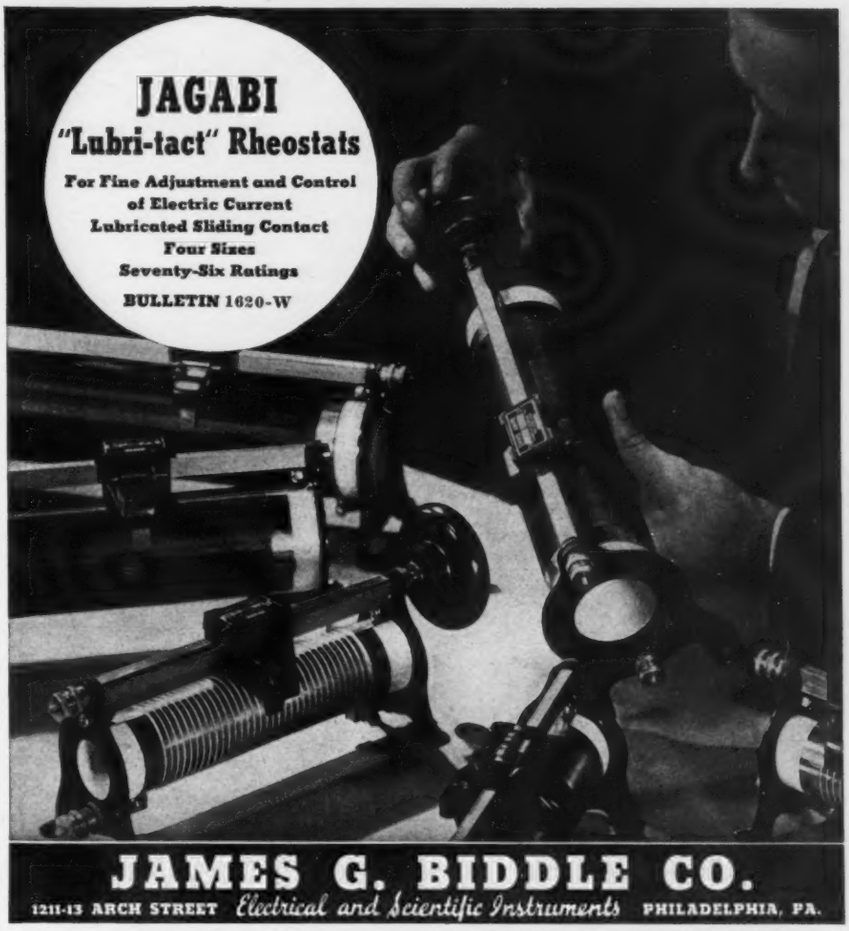
Plan Power Plant

Five electric membership co-operatives in the McMinnville, Tenn., area have banded together and perfected the Cumberland Mountain Electric, Inc., for the purpose of constructing a steam-electric generating station. The new group includes the Caney Fork Electric Co. of McMinnville, the Sequatchie Valley co-operative, Macon County co-operative, Volunteer co-operative and the Upper Cumberland co-operative.

•

Co-op Repays Members

Henry County REMC, Newcastle, Ind., has repaid $12,395 to 395 original members, who contributed $10 each to start the cooperative three years ago. REMC officials said the success of the venture prompted them to repay the original loans less a $5 meter deposit for each member. Included in the payment was $2,678 in interest.



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To Know Is to Understand

[*Continued from page 49*]

ing understudies. Future plans contemplate utilizing this medium to give supervisory people sufficient information on various important subjects in order that they, in turn, may bring to those working under them a consciousness of the significance of these problems.

To fit our specific training requirements, we have divided the process of employee training into three distinct parts, each serving a definite purpose. These three phases of training are:

1. General induction procedure.
2. Departmental induction procedure.
3. Job training.

Induction Procedure

Our entire program is based on the conviction that all members of our company are entitled to a more complete understanding of company policies and operations than they have an opportunity to obtain in the conduct of their daily work. We believe, moreover, that a program designed to furnish such information which starts later than the first hour of employment begins under a handicap. First impressions are lasting. Consequently, we recognized the need for some practical and effective means for the proper induction of new employees, some method of getting them off to the right start, not only by familiarizing them with purposes and policies of the company, but also by attempting to make them "feel more at home." This led to the establishment of what we have chosen to term general induction procedure.

This procedure is designed with a view to eliminating false impressions and inaccurate information resulting from a too casual introduction of an employee to an organization that is new to him. This is handled by the employment office, and the basic material used is a manual, "Things You Will Want to Know About Public Service," which contains a brief history of the company, a description of the company's business, its organization, policies and practices, and a discussion of working conditions and employee welfare practices.

The second phase of our training program, departmental induction procedure, is designed to give the new employee an understanding of the functions and objectives of the department to which he is assigned and its relationship to other departments; to impress him with the value of courtesy to customers, loyalty to the company, and related matters, and to foster a closer relationship between him and his supervisor and fellow workers. This phase of training consists mainly of talks to the new employee by his department head or his immediate supervisor. By this procedure the new employee is introduced to his immediate job surroundings and acquainted with working conditions and company and departmental regulations.

Job training involves the procedure necessary for training each employee in the details of the job itself, as well as training in other departments with which the new employee needs to be familiar in order to carry on his job. At present each department has its own established procedure for specific job-training activities, with future developments in this phase of training depending on the results of detailed studies devoted to specific job requirements.

It is too soon to measure tangible results of a program which is still in its early stages of development. However, the general employee reaction has been very gratifying. Likewise, it appears that the incidental benefits of this program have further justified the time and efforts entailed. For example, we feel that our training procedure, fully established in all its various aspects, prepares our organization to meet adequately and effectively any exigencies imposed upon our company and its operations by the national defense program.

•

Mexican Utility Will Proceed with New Unit

The Mexican Government has lifted the suspension on the new rate schedule of Mexican Light & Power Co., according to information provided at the annual meeting of shareholders. As a result, increased rates became effective on June 15. The chairman of the meeting, S. G. Cowell, also announced that, with the necessary authority of the Receiver of the Court, arrangements had been made to proceed with construction of a new 25,000 kw-hr. steam unit in connection with the company's plant.

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Ohio Municipals Give Rebate to Customers

For the second time this year, the Cygnet, Ohio, Board of Public Affairs has rebated a month's bill to patrons of the municipal power plant. The clerk of the board reported that there are sufficient surplus funds to meet any ordinary emergency. For the third successive year, customers of the municipal light plant at Rising Sun, Ohio, have received their June electric bills marked "paid," the village Board of Public Affairs has announced.

•

Completes Plant Addition

The Autocall Co. at Shelby, Ohio, has just completed and placed in operation a $100,000 addition to its plant to take care of a new sheet metal fabricating department. The new department will produce special steel cubicles, operator's desks, racks and miscellaneous panelboards.

•

REA Co-operative to Serve Marine Base

Rural Electrification Administrator Harry Slattery has announced an additional allotment of $1,655,000 to the Jones-Onslow Electric Membership Corp., Jacksonville, to complete generating and transmission facilities to serve the new Marine Corps Base and flying field in eastern North Carolina. Previously, the cooperative had received $150,000 from REA to begin the work.

The cooperative is now providing the power for construction of the base and flying field on an emergency basis by means of two 100-kw. mobile generating units and expects to put two more of these units into operation in the near future. Arrangements have also been made to buy a diesel plant of an inactive Nevada silver mine which is being moved to North Carolina where it will be reassembled. Most of the present allotment, however, will be used to build a steam generating plant to be ready for service when the base and field go into use.

REA has made a previous allotment to the cooperative of $284,000 for 291 miles of rural distribution lines serving 997 members in Onslow, Jones, Duplin and Lenoir counties.

Other REA construction contracts previously announced include:

TEXAS—Brazos River Transmission Electric Co-operative, Inc., Itasca, H. B. Gieb & Co., 1207 Texas Bank Bldg., Dallas, Tex., engineer, contract to F. A. Goll Co., 4934 West State, Milwaukee, Wis., 293 miles of line, bid, $476,650

VIRGINIA—Northern Piedmont Electric Co-operative, Culpeper, T. A. Jeffries,

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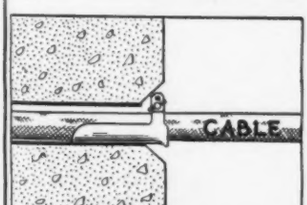

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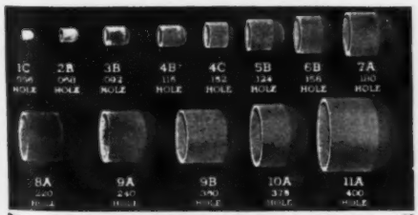

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TRENTON, N. J.

supt., and Welles Engineering Co., Front Royal, Va., engineer, contract to the Miller-Baxter Co., Inc., Indianapolis, Ind., 160 miles of line, 246 members; bid, $102,650.

WASHINGTON—Lincoln Electric Co-operative, Inc., Davenport, H. A. Sewell, Davenport, Wash., engineer, contract to Max J. Kuney Co., 418 Hutton Bldg., Spokane, 57 miles of line, bid, $108,951.

•

FPC Report Shows Utility T. & D. Figures

A total of 383 individual class A and class B privately owned electric utility operating companies operated a total of 121,176 circuit-miles of pole lines and 35,573 circuit-miles of tower lines at the end of 1939, according to the "Statistics of Electric Utilities in the United States, 1939," published by the Federal Power Commission.

Transmission Lines

Voltages—in Kv.	Circuit Miles Pole Lines	Tower Lines	Total
Under 11	4,388.30	.....	4,388.30
11 to 22	27,085.17	.....	27,085.17
23 to 33	34,136.56	1,274.54	35,411.10
34 to 44	15,255.22	1,329.98	16,585.20
45 to 66	28,400.42	8,419.03	36,819.45
67 to 110	9,816.07	11,989.40	21,805.47
111 to 132	1,967.11	9,035.03	11,002.14
133 to 220	127.93	3,517.87	3,645.80
over 220	.....	7.30	7.30
Total	121,176.78	35,573.15	156,749.93

Underground and submarine lines—cable miles 4,664.06*

*Includes 1, 725.80 miles reported as "circuit miles"

Substations

Low side 11 kv. and over Transformer capacity (kva.).....	41,633,809
Low side under 11 kv. Transformer capacity (kva.).....	41,429,458

Distribution Lines, Transformers, Meters

Overhead lines—pole miles.....	505,678.55
Underground and submarine lines—cable miles.....	86,478.79
Line Transformers—number	2,422,880
—capacity (kva.)....	36,585,651
Meters—number	26,059,206

Street Lighting and Signal System

Street lighting transformers —number	21,315
—Capacity (kva.).	305,311
Lamps—number	1,992,841

The transmission and distribution data in the FPC report cover in excess of 95 percent of the privately owned electric light and power industry, companies with annual electric revenue of $250,000 or more. The accompanying figures have been compiled from the report.

•

Plans 6,000-kw. Unit

In order to meet increasing demand for power, Bellefontaine, Ohio, city council has approved the installation of a new 6,000-kw. turbo-generator to double the potential production facilities of the municipal electric department.

The MOST COMPLETE LINE OF *Cable Taps*

Parallel and 90° taps—and combinations—for the widest variety of applications. For conductor sizes up to 1,000,000 CM.

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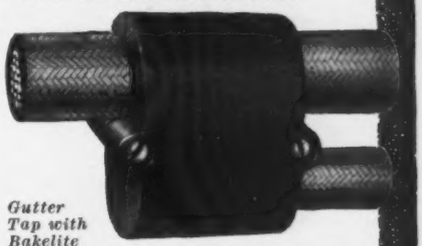
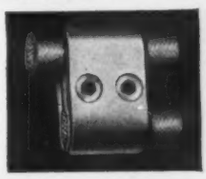
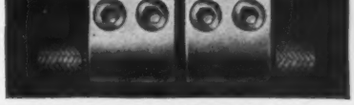


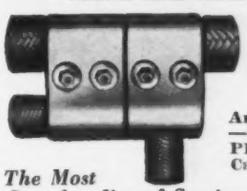
Gutter Tap with Bakelite Cover. Insulating covers can be furnished for all types of Penn-Union Cable Taps.



2-Way Gutter Tap; main and branch sizes 8 to 1,000,000.



Two Separate Parallel Taps to a continuous main conductor.



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Municipal Ownership Before San Francisco

San Francisco's Public Utilities Commission has begun preparation of a public ownership plan to be placed before voters in the November election to effect compliance with Secretary Ickes' court victory on disposal of by-product power from the Hetch Hetchy water supply system. Present idea is to submit a revenue bond proposal ranging between $65,000,000 and $70,000,000 for purchase of the Pacific Gas & Electric Co. distribution facilities within the city limits, construction of a transmission line from Newark substation to San Francisco and erection of a power house at Red Mountain Bar on the Hetch Hetchy aqueduct. Similar proposals have been defeated eight times in past elections.

Several alternative plans have been submitted to city officials, but have been rejected. One was that an immediate attempt be made to get Congressional amendment of the Raker Act (the grant under which Hetch Hetchy was turned over to the city) to permit sale of power. Another was that the municipal power plan be confined to a $20,000,000 proposition, just sufficient to distribute the present Hetch Hetchy output. The third was that an attempt be made to sell the power to the Central Valley project at the same rate now paid by PG and E.

Secretary Ickes has made nine stipulations to which the city must conform to secure his support for a stay of execution of court judgment that would deny the city present power sales revenues. Among them are that no other bond issues will be submitted in the same election; that Secretary Ickes must have an opportunity of approving the plan before it goes on the ballot; that no attempt be made to amend the Raker Act, and that city officials will "actively and in good faith" support the proposition.

•

Bonneville Adds to Power Facilities in Northwest

First of three Bonneville substations in eastern Oregon was energized last Saturday at The Dalles when the power administration began service to the Wasco County Electric Co-operative by way of the 40-mile Bonneville-The Dalles transmission line. On June 1 the Walla Walla-Pendleton circuit and substations at both terminals were energized. Power service is scheduled to begin shortly to the United States Army airport at Pendleton, while present plans call for construction work to start soon on extension of the Pendleton lines as far as La Grande, Ore., to serve the Union County Public Utility District.

The fifth generating unit at Bonneville, with a capacity of 54,000 kw., and the first of eighteen large units at Grand Coulee, with a capacity of 108,000 kw., will be ready for operation during the summer, according to Administrator Paul J. Raver. In January a second 54,000-kw. unit will be installed at Bonneville and a second 108,000-kw. unit at Grand Coulee, giving the system a total of 532,400 kw. available for Northwest power needs.

•

FPC Allows Additional Power for Aluminum Co.

Federal Power Commission has authorized the Niagara Falls Power Co. by telegram to supply an additional 500 kw. of power immediately to the Aluminum Co. of America to be used in increasing defense production of aluminum in New York State by nearly 500,000 pounds a year. The action was requested by the Aluminum Co. of America.

The additional power which the commission authorized for aluminum production will be provided from power produced from the temporary emergency diversion by the United States of an additional 5,000 c.f.s. of water from the Niagara River under the special agreement with Canada approved by the Senate last month.

•

Appliance Sales Gain

Sales of electrical appliances in Cleveland show substantial gains over last year. The Electrical League of Cleveland reports for the first five months the sale of 2,001 electric ranges in Greater Cleveland, an increase of 75.1 percent over last year. Sales of furnace blowers totaled 1,043, against 656; cleaners, 12,285, against 8,895; clothes washers, 15,513, against 9,684; ironers, 1,521, against 1,011; oil burners, 143, against 49; and refrigerators, 26,258, against 18,835.

•

Seeks Utility Priority

Thomas J. McKee, secretary of the Board of Public Utilities, Jamestown, N. Y., on behalf of the Municipal Electric Utilities Association of New York, has requested the priorities division of OPM to grant priority over all non-defense industries to municipalities which own and operate electric plants.